

Special Initiatives
Report No. 18

**Case Study on the
Costs and
Financing of
Immunization
Services in Morocco**

September 1999

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Partnerships
for Health
Reform



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- ▲ *improved incentives within health systems to encourage agents to use and deliver efficient and quality health services; and*
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Abstract

The government of Morocco has built a strong immunization program over the past 12 years and has seen impressive gains in immunization coverage. The Partnerships for Health Reform Project, in collaboration with the World Health Organization and the Ministry of Health, conducted an in-depth study of the costs and financing of immunization in Morocco, culminating in this report. This study was conducted in the fall and winter of 1998-1999 and is one of a series of four country case studies on immunization financing. The objectives of the study are to estimate the current and future costs of the country's immunization program, to assist the ministry with program planning, to provide recommendations to the Moroccan government on ways to improve its financing strategies, and to draw lessons learned from Morocco's immunization financing strategies for the international health community at large. Financing strategies for immunization have become increasingly important due to Morocco's heavy reliance on external funding through donors such as the World Bank; and the analysis and recommendations in this study are presented in the context of prospects for financial sustainability. Costs and financing data used in the analysis were obtained through government documents and through government and private sector interviews. The financial analysis is based on estimated costs rather than expenditures recorded to provide a more inclusive accounting of resources being used. The analysis also provides estimates for projected expenditures for the next five years. The report concludes with a set of options in the areas of program planning, management, evaluation, research, vaccine procurement and supply, and financing structures to improve the financial sustainability of Morocco's immunization program.

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Acronyms

ADB	African Development Bank
AMO	<i>Assurance Maladie Obligatoire</i> (Mandatory Health Insurance)
ARI	Acute Respiratory Infection
BAJ	World Bank Social Priorities Program (Arabic acronym)
BCG	Bacille-Calmette-Guerin (vaccine against tuberculosis)
CERED	Center for demographic research
CFIC	Crude Fully Immunized Child (all children immunized, regardless of age)
CNOPS	Caisse Nationale des Oeuvres de Prévoyance Sociale (public employee insurance program)
CNSS	<i>Caisse Nationale de la Sécurité Sociale</i> (private sector social security system)
DH	Dirham (Moroccan currency)
DHS	Demographic and Health Survey
DPT	Diphtheria, Pertussis, Tetanus
EPI	Expanded Program on Immunization
ESSB	Etablissement de Soins de Santé de Base (primary health care facility)
FIC	Fully Immunized Child
FNAM	Fond National d'Assurance Maladie (solidarity fund for poor)
FY	Fiscal Year
GDP	Gross Domestic Product
GOM	Government of Morocco
HBV	Hepatitis B vaccine
Hib	Haemophilus Influenzae Type B
IEC	Information, Education, Communication
MCH	Maternal and Child Health
MIS	Management Information System
MMR	Measles, Mumps, Rubella (vaccine)
MOH	Ministry of Health
NGO	Non-governmental Organization
NID	National Immunization Day
OPV	Oral Polio Vaccine

PHR	Partnerships for Health Reform Project
NIP	Programme National d'Immunisation (National Immunization Program)
PRISS	World Bank Health Section Investment Project (French acronym)
SEGMA	Services Etatiques Gérés de Manière Autonome (Autonomous Public Health Services)
SIAAP	Service d'Infrastructure d'Actions Ambulatoires Provinciales (Provincial ambulatory services)
TT	Tetanus Toxoid Vaccine
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VAT	Value Added Tax
VII	Vaccine Independence Initiative
WHO	World Health Organization

Currency Conversion

This study uses 9.7 Moroccan dirhams = US\$ 1

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Executive Summary

Background, Objectives and Methods

The Partnerships for Health Reform Project, in collaboration with the World Health Organization (WHO) in Geneva and the Ministry of Health (MOH) in Morocco, conducted an in-depth case study on the cost and financing of immunization services in Morocco. This study, which is one of a series of four country case studies on immunization financing, was conducted in the fall and winter of 1998/1999. The main objectives of the study were to:

- 1) Draw lessons learned concerning immunization financing strategies in Morocco that other countries and the international health community can use in planning sustainable financing of immunization programs with country resources;
- 2) Estimate the current and future costs of the country's immunization program, including the additional costs associated with the introduction of new vaccines and other innovations and improvements, both to assist Morocco in planning its program and to update and add to the available information on immunization costs for the global community; and
- 3) Provide recommendations to the Moroccan government on ways to improve its immunization financing strategies for the current program as well as for the introduction of additional vaccines and other innovations or improvements.

Cost and financing data for this analysis were obtained through government documents and in-depth interviews with key informants in the Ministry of Health, the Ministry of Finance, the private sector, and the donor community. Estimates of the total costs of the National Immunization Program (*Programme National d'Immunisation*, NIP), as well as the recurrent variable costs were calculated. The financing analysis is based on the estimated costs—as opposed to expenditures—to make it possible to account for all resources for the program, including donor contributions, in-kind contributions from communities and from other (non-health) sectors of the government, and personnel time. The study provides estimates of the share of financing by each major funding source, both in terms of the total estimated cost of the program and the “program-specific” costs, that is, the costs that are incurred specifically for the delivery of immunization services.

This analysis also provides estimates of the projected expenditures required for the next five years to enact a series of improvements to the program, including the introduction of Hepatitis B, and closing the projected gap in funding. The report ends with an analysis of options to improve the program's financing in order to create a truly sustainable program based primarily on country-level resources, including central government allocations, as well as new potential resources such as insurance and local government contributions.

Main Findings

Costs:

- ▲ The estimated overall total annual costs of Morocco's NIP is around \$11.2 million. This is the equivalent of around US\$ 0.77 per dose, \$21 per fully immunized child under one year, and \$0.40 per capita. Sixty percent of these annual costs—or around \$6.7 million—are personnel costs, mainly the value of the time health workers devote to providing and managing immunization services. Vaccines account for 20 percent of total costs, capital costs (building space, equipment, vehicles, etc.) account for another 11.5 percent and transportation costs around 5 percent.
- ▲ The National Immunization Days (NIDs) make up almost one-third (32 percent) of the total estimated cost of the program—around \$3.5 million per year.
- ▲ The improvements to the program planned by the MOH for the next five years will more than double the required annual funding the MOH must find for the program—from around \$3 million to more than \$6 million per year. These improvements cover several areas, including the introduction of the Hepatitis B vaccine nation wide, replacement of cold chain equipment, management information systems (MIS), supervision and reporting systems.

Financing:

- ▲ In terms of the overall Ministry of Health budget, the total costs of the NIP channeled through the MOH accounted for around 2.6 percent of the total MOH budget in 1997/98. Recurrent, variable non-personnel costs of the immunization program accounted for 3.6 percent of the MOH investment budget, through which most of these costs are funded.
- ▲ The NIP program is primarily dependent on external funding and, as such, is vulnerable to any changes in the financing of the program. For instance, the government paid an estimated \$8.1 million or around 73 percent of the *total estimated costs* of the entire program for 1997/1998. The bulk of the total resources designated specifically for immunization activities (72 percent) has been financed by external resources, in the form of the World Bank loan (61 percent) and donor contributions (11 percent), including three main components of the NIP: vaccines, cold chain equipment, and supplies. External resources also account for 68 percent of the program-specific costs requiring purchases in hard currency. The routine immunization program is particularly dependent on external resources (estimated 90 percent).
- ▲ Due to Morocco's participation in the Vaccine Independence Initiative, the government has been able to purchase high-quality, relatively low-cost vaccines since 1994. If the NIP improves the way it determines vaccine needs and manages stock, the current capitalization of \$1.1 million is more than adequate to meet the program's current estimated needs of \$1.3 million per year for the traditional Expanded Program on Immunization (EPI) antigens. However, the addition of Hepatitis B vaccine to the children's immunization schedule will require additional capitalization of the revolving fund.

Funding of Immunizations in the Future:

- ▲ Funding for the NIP will have to increase substantially beginning in the year 2000, if the government is to implement the planned changes and improvements. The gap between required funding and projected funding available through the government will be around \$3 million for the next two years (fiscal years 1999/2000 and 2000/2001). Assuming that

World Bank loan funding will not be available to the program after the current loan ends in fiscal year 2000/2001, this funding gap will grow to \$4 million or more per year.

- ▲ Three scenarios for financing the immunization program, including the additional sums needed for the planned improvements over the next five years, are presented in this analysis. The scenarios show the potential for mobilizing new internal resources from local or provincial governments, as well as from the planned mandatory payroll-based insurance (AMO), if a proposed law requiring coverage of immunizations and other preventive health services is passed.

Lessons Learned

- ▲ The government of Morocco has achieved impressive gains in immunization coverage in the last decade; thanks to use of the World Bank loan to pay many of the recurrent variable costs of the program, which has helped the MOH protect funding for immunization services, as well as the use of national immunization days (NIDs) as a major means of boosting immunization coverage quickly.
- ▲ However, both the financing strategy of depending heavily on World Bank loan funds and the strategy of relying on the NIDs to increase coverage were short-term fixes that are not sustainable over the long term. Essentially, the World Bank loan is ending in two years and the NIDs cannot compensate for the inequities in routine service delivery.
- ▲ Morocco will need to gradually reduce its dependence on external support and therefore allocate, as well as generate, additional local resources to pay for current levels of immunization services and planned improvements. Most importantly, Morocco must allocate adequate local resources to fund recurrent costs so as to reduce disruptions in services due to changes in donor support.
- ▲ Finally, to establish an immunization program that is both successful and sustainable over the long term, the Moroccan government needs to develop annual and multi-year strategic plans for the NIP within the national strategic health plan. This plan should be based, first of all, on the government's objectives and the immunization needs of the population—which should be based on solid data—and then on the availability of resources. Reliable data collection will require technical assistance for improving the NIP's and MOH's capacity in planning, applied research, and in intra- and inter-agency coordination.
- ▲ Please refer to Chapter 7 for a more detailed description of the major findings, conclusions, and recommendations.

Recommendations

Program Planning, Management, and Evaluation of the Program

- ▲ The government should develop a national immunization strategic plan for the next 10 years, which will include: program objectives; plans for the introduction of new vaccines and technologies; plans for conducting additional research to obtain critical information on which to base program decisions; plans for capacity building and implementation (organization, training and technical assistance); and for financing the program in a

sustainable manner, based largely on country-level funding and in conjunction with the planned health sector reforms.

- ▲ To improve monitoring and evaluation of provincial programs, EPI coordinators and other relevant personnel should develop detailed annual immunization plans on quantifiable coverage and other performance objectives by province or region; activities planned to increase coverage; and resources to be mobilized by province.
- ▲ The consideration and analysis of costs should be included in the program decision-making process on a more systematic and regular basis, along with the considerations of effectiveness and quality. This is critical in facilitating reduction of external support for the national immunization program. Primary focus areas are selection of new vaccines, use of NIDs, advantages and disadvantages of various service delivery strategies, training needed in costing and financial analysis, and appropriate methods of data collection and use of information.
- ▲ Training in different aspects of planning, management, and evaluation should be provided to the NIP and other staff to build long-term capacity in these areas.
- ▲ Planning for the decentralization of the health system, as it affects the NIP, should begin soon and be incorporated into the long-term NIP strategic plan. The role of the central-level NIP should change accordingly to move away from the day-to-day management of the program to overall planning and coordination, procurement of vaccines and supplies, reporting and evaluation. The role of the regional and provincial governments will likely increase.

Applied Research

Plans for the future of the program, including the introduction of new vaccines and technologies, and the diversification of financing sources and mobilization of new resources, should be based on information concerning health needs, effectiveness, costs and cost-effectiveness. Given the program's objectives and plans for the future, the following studies and operational analyses are recommended:

At the National Level

- ▲ A study of cost regarding the generation and use of revenues for immunization programs, as well as the feasibility of officially instituting cost-sharing mechanisms for immunization services in the government sector;
- ▲ A study of the current cold chain system with periodic updates to determine the numbers, types, and condition of equipment in use, the equipment and storage needs for the next 10 years or so, and what type of system to put in place to manage and monitor the system on a regular basis.
- ▲ An inventory of cold chain equipment at the provincial level should be considered as a first and crucial step in determining needed improvements;
- ▲ A study on the current and potential role of the private sector in immunization service delivery and financing, including barriers to private sector involvement and impact of increasing private sector participation on quality and access;

- ▲ For long-term planning, studies on the burden of disease targeted by new vaccines, such as Hib and rotavirus, to determine how best to structure and effectively target vaccine introduction, organization of activities, and resource mobilization; and
- ▲ An in-depth analysis of what a future measles elimination campaign would involve in terms of target population, length of time to achieve elimination, costs, financing, and involvement of other sectors of the government and of society, impact of this on resources for other NIP and MOH activities.

At the Provincial Level

- ▲ An analysis of the differences in immunization coverage by province and socio-economic level of the population in order to determine effective strategies for improving coverage in low performing areas;
- ▲ An analysis for each province of the potential for reducing vaccine wastage, for which antigens, and how to reduce wastage; and
- ▲ An applied study on ways to improve immunization coverage, considering the effectiveness, costs, and cost-effectiveness of different delivery and social mobilization strategies.

Vaccine Procurement and Supply

- ▲ As a significant cost-saving measure, the NIP and MOH should assume a greater role in projecting vaccine needs and in procuring vaccines. Training of NIP staff is needed in determining vaccine needs based on actual projections of the target population and on current vaccine wastage rates in Morocco for each antigen, as well as in negotiating international procurement and overseeing logistical management of vaccines. Central- and regional-level training for reducing vaccine wastage is also strongly advised.
- ▲ The MOH should strongly consider procuring Hepatitis B vaccine through the UNICEF Procurement System, given UNICEF's reasonable prices and assured good quality.
- ▲ The Moroccan government should establish a national authority for the control of biological products integrating the unit for control of vaccines and serums of the director of medicines and pharmacies in anticipation of buying vaccines outside of the UNICEF procurement system in the future, if it decides to do so. WHO/Geneva can potentially assist in the process of establishing the control authority and training of its staff.

Financing

- ▲ The government of Morocco needs to develop a phased plan for fully funding vaccine and vaccine supply needs as of 2001/2002. It should become the primary funding source for immunization programs by mobilizing local resources. Gradual reduction in the use of external funds can be accomplished through a variety of means, including increased central budget allocations, and mobilization of local resources such as health insurance schemes, local government contributions, and increased private sector service delivery.

- ▲ The MOH and NIP should seriously consider the following:
 - △ Promoting the coverage of immunization services to workers and their families by the payroll-based AMO insurance program, supporting the passage of a proposed law requiring inclusion of priority health services in AMO coverage, and conducting studies to help determine structuring of immunization services, financing mechanisms, and private-public sector partnerships in service delivery.
 - △ Creating a NIP assistance fund to mobilize external resources for immunizations in an integrated fashion according to the priorities defined by the MOH, and
 - △ In the context of the line item budget related to vaccines, maintaining and validating this line to take into account the new vaccines such as Hepatitis B, to help ensure adequate financial resources for future procurement.

Conclusion

As mentioned above, Morocco has made great strides in increasing coverage rates and in building its overall immunization program. Still, the program is quite vulnerable due to an overwhelming reliance on external resources, particularly to fund recurrent variable costs. The MOH has ensured the visibility of immunization services within the government, and is clearly now at a crossroads in terms of restructuring the program to enhance access, cost-effectiveness, and long-term sustainability. In addition, the vision and the planning for the program must be carried out within the context of health reform, specifically, the ongoing decentralization of the overall health system.

1. Introduction and Background

1.1 Background and Purpose of Study

In recent years, national governments and the international health community have become increasingly concerned with the issue of financing childhood vaccines and immunization programs. Despite tremendous gains achieved in immunization coverage in the 1980s in nearly all developing countries with the establishment of national immunization programs—often called Expanded Program on Immunization (EPI)—coverage rates in the 1990s have reached a plateau or even declined in a number of countries, as donors reduce their funding for immunizations, as national health budgets decline with deteriorating economic conditions, and as national health priorities, such as HIV/AIDS, consume increasing attention and limited health funds.

The introduction of additional vaccines, including Hepatitis B and *Haemophilus influenzae type b* (Hib),¹ into national immunization programs has also been delayed in many countries, due largely to the high costs of these vaccines relative to the pennies-per-dose costs of the traditional childhood vaccines.² A major challenge facing countries today is to incorporate these and other new vaccines (e.g., rotavirus) into their immunization programs, while improving or maintaining coverage rates for the traditional vaccines and without sacrificing other critical health interventions and programs. According to the coordinator of the inter-agency Children's Vaccine Initiative, "sustainable financing of current and new vaccines is the biggest problem facing immunization today. Unless we can develop new solutions and new attitudes toward the funding of vaccination, all of the advances in science and all of the investment to establish the delivery infrastructure will have no further value to most of the world's children."³

To address these issues, the Children's Vaccine Program of the Child Survival Division of the United States Agency for International Development (USAID) Office of Health and Nutrition asked the Partnerships for Health Reform (PHR) Project to develop a special initiative on immunization financing. The goal of this activity is to assist in the evaluation and development of country-level financing strategies for replacing donor funding and sustaining and expanding immunization programs with local resources. One of the main activities of this special initiative is to conduct several country case studies on immunization financing in order to both provide lessons learned concerning country-level immunization financing strategies that other countries and the international health community can use in planning sustainable national immunization programs, including the introduction of additional vaccines. These case studies are being conducted in collaboration with the World Health Organization (WHO) and the Pan American Health Organization.

¹ Hib vaccine protects against severe invasive syndromes such as meningitis and pneumonia caused only by type b of *Haemophilus influenzae* strains.

² The six "traditional" EPI antigens are: BCG (Bacille Calmette-Guerin [against tuberculosis], DTP (diphtheria, tetanus, and pertussis), polio, and measles vaccines.

³ Letter of 25 August 1997 from Roy Widdus to Dr. Steven Landry of USAID's Children's Vaccine Program.

Morocco was chosen by PHR and WHO as the first case study country because of the expressed interest of the Moroccan Ministry of Health (MOH) and the USAID Mission, and because it met most of the criteria established by PHR for selecting countries. These criteria include: a well-performing immunization program; the planned introduction of additional vaccines; current or planned diversification of financing sources for immunization services; current or planned health sector reforms, and participation in a program to facilitate vaccine financing, such as the Vaccine Independence Initiative (VII).

To conduct the case study in Morocco, a joint PHR/WHO team was formed, consisting of a health economist and research analyst from PHR, a costing specialist, and an epidemiologist/immunization specialist provided by WHO/Geneva. WHO was particularly interested in obtaining more detailed information on the total costs of immunizations than was originally planned for this financing study. This team was joined by the head of Morocco's National Immunization Program (*Programme National d'Immunisation*, NIP), and the financial manager of the MOH Population Division (under which the NIP is placed), who were appointed by the Ministry of Health as key resource persons for the study. The PHR/WHO team made two trips to Morocco, in October 1998 and February 1999.

1.2 Socio-Economic Context of Morocco

Morocco is a country of approximately 28 million people, 48 percent of whom live in urban areas. It is a middle-income country with a GNP per capita of around \$1,250, although the rate of growth of the GDP varies considerably from year to year as shown in Table 1 below.

Table 1. Basic Economic Indicators, Morocco, 1993–97

Economic Indicators	1993	1994	1995	1996	1997
Real GDP growth %	-1.0	11.1	-6.3	11.5	-2.2
Population	26.1	26.6	27.1	27.6	28.1
Total external debt (\$ bn)	20.9	21.7	23.0	21.8	21.2
Debt service ratio, paid %	35.6	35.5	33.0	27.4	31.3
Exchange rate (av dirham:US\$)	9.299	9.203	8.540	8.716	9.527*

*February 1999: 9.120

Overall, the economic growth rate has averaged 4 percent per annum during the last two decades. Nevertheless, this modest rate of growth and the irregularities that occur from year to year have meant that it is insufficient to truly strengthen the economy. This is largely due to the fact that the Moroccan economy is dependent on agricultural production that varies according to climatic conditions and on the export value of phosphates and textiles.

Another factor that adversely affects the economic situation of Morocco is the high level of debt. Currently, the foreign debt is in excess of \$20 billion, and almost one-third of all export earnings is devoted to repaying this debt. The public debt is also substantial, and it has risen from 20 percent of GDP to more than 35 percent in 1997. The room for the government of Morocco (GOM) to maneuver financially is, thus, limited by these two constraints.

A third constraint to be considered is the level of international competition linked to GATT/World Trade Organization agreements and association of Morocco with the European Union as its major trading partner. These agreements impose new standards and require a marked reduction

in the ability of the GOM to protect local production. The challenge posed by this international competition is leading to a deep restructuring of the economy. The openness of the economy to this change carries with it a heavy social cost that is felt long before the benefits and anticipated advantages for the economy and the Moroccan people appear.

The strong geographical concentration of economic activity leads to enormous social inequalities between urban and rural areas and among regions. In addition, the supply of drinking water and electricity in rural areas lags behind that of urban areas. Weaknesses in basic equipment and social infrastructure with respect to transportation, education, and basic health services are also serious.

In considering the overall socio-economic situation of Morocco, it is important to look beyond these basic economic factors to assess their impact on the social situation of the country. One finds that in spite of many efforts and some progress in recent years, social conditions are characterized by increasing unemployment, significant levels of illiteracy, disparities between urban and rural areas, and poverty. Each of these factors will be considered in turn.

The first of these factors is an increasing rate of unemployment, which has risen from 10.6 percent in 1960, 8.8 percent in 1971, and 10.7 percent in 1982 to almost 19 percent in 1998. Unemployment primarily affects urban groups, young people, women, and recent graduates. Rural areas suffer from underemployment, droughts that affect agricultural production, and living conditions that are less favorable overall.

Illiteracy is the second social factor to be considered. It has fallen dramatically from a rate of nine out of 10 people being illiterate in 1960 to one in two in 1997. Women (82 percent) and rural areas (87 percent) are the most affected. In rural areas, 96 percent of women have never attended school.

Living conditions in general are marked by wide disparities between urban and rural areas. It is estimated that 73 percent of the poor population lives in rural areas. According to the 1994 population census, 75 percent of city dwellers have direct access to clean drinking water whereas only 4 percent of rural people have this advantage. Only 1.3 percent of rural households use a sewage system to carry away waste products whereas 67 percent of city residents have one. One household in 10 is equipped with electricity in rural areas versus eight out of 10 in urban zones.

Differences between the urban environment and rural areas in the field of health are also significant. Broadly speaking, health indicators are twice as bad in rural areas. Infrastructure and qualified personnel are concentrated in large cities. Less than 13 percent of nurses work in rural areas. The number of itinerant nurses has fallen 10 percent between 1992 and 1995. It is estimated that 14 percent of the inhabitants of rural zones have no access to health services. Another 40 percent must travel more than 10 kilometers to reach a basic health service while only 18 percent are within 3 kilometers of a health care facility. Moreover, health services in rural areas frequently lack drugs, consumables, and other products.

Poverty remains a significant problem despite a clear decline since 1970. The number of poor has fallen from 6 million in 1971 to 4 million in 1991/92 despite the increase in the population from 15.4 to 25.6 million during the same period.

Since 1998, important political changes have been underway. These changes have resulted in the development of new economic and social policies that address the current problems of poverty and under-development.

These policies include:

- ▲ Reducing public financial deficits, reemphasizing growth and investment
- ▲ Prioritizing human development and establishing the importance of introducing a national health insurance and medical fund for indigent and poor populations
- ▲ Encouraging non-governmental organization (NGO) activities and community initiatives
- ▲ Supporting development partners in the fight against poverty and inequality

1.3 Overview on Health Status and the Health System in Morocco

1.3.1 Health Status

Over the past two decades, Morocco has been undergoing both a demographic and epidemiological transition. Between 1980 and 1995, the population growth rate decreased from 2.5 to 1.9 (GOM, 1994a and 1996c). The total fertility rate has steadily declined from an estimated 7.2 children per women in 1960 to 5.2 in 1981/82 and 3.3 per women in 1996. There continue to be significant differences in total fertility rate between the rural and urban areas, however; the estimated rate in rural areas in 1996 (4.5) was double the rate in urban areas (2.2) (GOM, 1994a and 1996c, UNFPA).

Parallel with the decrease in population growth has been the decrease in infant mortality in the past two decades, as shown in Table 2. The overall rate has declined from an estimated 91 deaths per 1,000 live births in 1980 to 66 in 1995, a 33 percent decrease. This compares to an estimated infant mortality rate of 34 in the neighboring country of Algeria in 1996 and 28 in Tunisia (UNICEF, 1998). The infant mortality rate in rural areas, where an estimated 50 percent of the population lives, continues to be considerably higher than in the urban areas—in fact, nearly double (79 per 1,000 live births vs. 41 per 1,000). Neonatal mortality, estimated at 39 per 1,000 live births in 1995, accounts for more than half of infant deaths. However, the decrease in infant deaths since 1987 cannot be explained by a change in neonatal mortality, since it has remained about the same between 1987 and 1995. The life expectancy at birth in 1995 was estimated at 66 years, up from 48 years in 1967 and 59 years in 1980 (UNICEF, 1998; *Centre d'Etude et de Recherche en Demographie* [CERED], 1995a).

Table 2. Neonatal and Infant Mortality Rates in Morocco, 1970–1995

Mortality Rates (per 1,000 live births)	1970	1980	1987	1992	1993	1995	Change 1980–1995
Neonatal mortality rate							
Urban	—	—	31.1	28.1	29.9	29.9	
Rural	—	—	39.5	33.0	36.6	43.3	
Total	—	—	36.5	31.3	34.0	38.8	
Infant mortality rate							
Urban	—	73.0	60.2	43.5	37.6	41.4	-48
Rural	—	99.0	75.0	64.8	61.4	78.6	-26
Total	100	91.0	73.5	57.4	54.7	66.0	-33

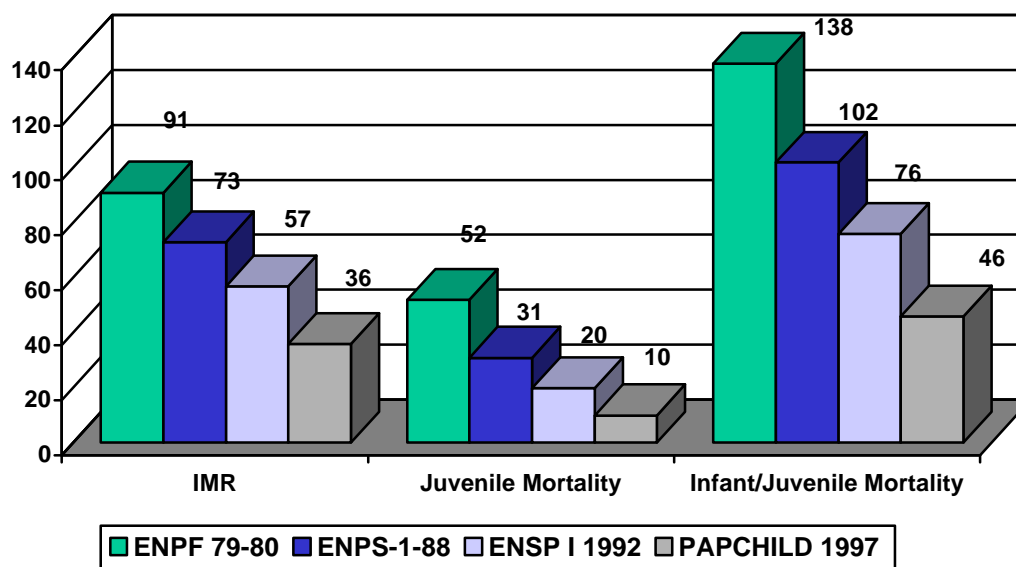
Sources: GOM, 1996c, Demographic and Health Surveys, 1998 and 1992.

Although infectious disease rates overall have steadily declined, accounting for an estimated 5.3 percent of total deaths in 1994, as compared to 15 percent in 1960, they continue to be the major causes of morbidity and mortality in children (GOM, 1996c). The leading causes of childhood deaths and illnesses are diarrheal diseases, accounting for 21 percent of deaths in children under one year and 28 percent of deaths in children one to five years old in 1996, acute respiratory infections (ARI), which account for another 11 to 14 percent of childhood deaths, complications due to childbirth, measles and meningitis (United Nations Development Programme [UNDP], 1998). As discussed in Section 1.4 below, vaccine-preventive diseases account for less and less of overall childhood morbidity and mortality, especially since 1987, when the Moroccan NIP began. Nutritional deficiencies are still a significant problem in Morocco; in 1994, an estimated 36 percent of children less than five years old had iron-deficiency anemia, as did 46 percent of pregnant women (World Bank, 1996). The same survey reported that 22 percent of children six to 12 years old in the country overall, and as much as 77 percent of children in certain regions, suffered from iodine deficiency.

Maternal mortality, which the 1992 Demographic Health Survey (DHS) estimated at 332 per 100,000 births and a 1996 WHO/UNICEF report estimated to be 610 per 100,000 births, is extremely high for the region and for Morocco's economic level (UNICEF, 1997). This is explained in part by the fact that more than half (55 percent) of pregnant women receive no pre-natal care, only an estimated 37 percent deliver at a health facility, and only 11 percent of births are assisted by doctors, with another 29 percent assisted by a nurse or midwife.

A lack of access to clean water and basic sanitation among many segments of the population are undoubtedly a major reason for the continued importance of infectious diseases as causes of mortality and morbidity among children. Only an estimated 65 percent of the population, and only 34 percent of the rural population, has access to safe water, and 58 percent of the total population and 24 percent of the rural population has access to adequate sanitation (UNICEF, 1998). More recent studies (such as PAPCHILD) confirm the seriousness of the basic health problems, but they also show the net progress made in the last few years in the fight against maternal, infant and neonatal mortality.

Figure 1. Infant and Juvenile Health Indicators, 1980–1997



1.3.2 Morocco's Health Care System

1.3.2.1 Government Health System

The great majority of health care in Morocco is provided by the public sector in a system run by the Ministry of Health, which consists of a network of hospitals, health centers, and dispensaries. There are currently 106 public hospitals in the country, which include rural, provincial, regional, and national hospitals. The hospitals have around 25,700 total beds, for a ratio of one public bed per 1,060 inhabitants (World Bank, 1998). Two-thirds of the hospitals depend entirely on government budget allocations, and the remaining one-third, designated as SEGMA hospitals (*Services Etatiques Gérés de Manière Autonome*) enjoy at least partial autonomy in the area of financial management; nine are more fully autonomous and are allowed to retain revenues generated by user fees.

Primary health care services, including immunization services, are largely provided through a network of approximately 600 rural dispensaries; 800 rural health centers, 132 of which provide childbirth services; and 530 urban health centers, for a total of over 1,900 *Etablissements de Soins de Santé de Base* (ESSB, primary health care facilities). Health centers are staffed by physicians, nurses, and itinerant nurses, who conduct outreach activities. There has been tremendous growth in the number of primary care facilities, especially in the rural areas, since 1987, when the total number nationwide was approximately 800. There is currently one ESSB for every 9,800 people in the rural areas, up from one per 27,300 in 1960, and one ESSB for every 28,100 people in the urban areas, up from one for every 36,800 in 1960 (MOH data). Despite this growth in the last decade, health facilities remain out of reach for many rural inhabitants; according to the MOH, around 31 percent of the rural population must travel more than 10 kilometers to reach an ESSB (GOM, 1998). And according to the World Bank, 14 percent of the rural population is not covered at all by the health system, "even in theory" (World Bank, 1996).

While the number of doctors, nurses, and nurses aides has also grown tremendously in the past several decades, the majority of health personnel, including 89 percent of public sector physicians, and 87 percent of nurses and other paramedical staff, are concentrated in urban areas, and the majority of these work in hospitals. The number of habitants per nurse working in an ESSB in the rural areas is nearly double (4,000) the number of habitants per ESSB nurse in the urban areas (2,200). Overall, there were 10.1 nurses per 10,000 people in 1995, as compared to 28.3 nurses per 10,000 people in Tunisia.

Immunization services are largely provided by MCH nurses and traveling nurses aides operating from health centers, dispensaries, and hospitals. The NIP in each of the country's 71 provinces is the responsibility of the provincial-level *Service d'Infrastructure d'Actions Ambulatoires Provinciales* (SIAAPs) each of which has a full-time EPI coordinator (*animateur*), usually a nurse, as well as a chief medical officer. The SIAAP staff are responsible for ordering and storing vaccines for the entire province, maintaining the cold chain, monitoring routine immunization activities, reporting immunization and other primary health care service statistics to the central level, and organizing the National Immunization Days (NIDs) and mini-campaigns at the provincial level.

In addition to the services run by the Ministry of Health, a separate Royal Army health system provides services to military personnel and their families.

1.3.2.2 Private Health Sector

The private health sector in Morocco has been growing rapidly in the last several years. The number of private physicians is currently growing by more than 10 percent a year and 50 percent of all physicians in Morocco are now in the private sector (World Bank, 1998). However, the great majority of these are located in and around the urban areas of Casablanca and Rabat or at the outskirts of these areas. According to the MOH, there is one private clinic (*cabinet*) per 4,354 people in the urban areas, but only one for every 95,418 persons in the rural areas (GOM, 1998). Consequently, for the country as a whole, the private sector continues to play a relatively small role in the provision of health services. Services, mainly curative in nature, are provided through 192 clinics, which represent 18 percent of the country's bed capacity, and 3,461 medical offices, which provide outpatient consultations, radiology, and laboratory exams (World Bank, 1998). The private sector also includes a growing number of private pharmacies (estimated at 2,714 in 1993), although, again, the majority (62 percent) are located in either Casablanca or Rabat (WHO, 1997). The private sector mainly serves the urban upper class and those who have private or employee-based insurance (an estimated 15 percent of the country's population).

The role of the private sector in delivering immunization services is considered quite small—the MOH estimates that 2 to 4 percent of all immunizations are delivered by private providers, mainly to the better-off segments of the urban population. However, in Rabat and Casablanca, private providers are an increasingly important source for immunization services, and the only source of non-EPI vaccines, such as Hepatitis B, Hib, and the flu vaccine. Private pharmacies also administer vaccinations directly to clients, especially vaccines such as Hepatitis B, flu vaccine, and rabies, which are not available in the public sector, but the pharmacies' role is considered quite small. Vaccines in the private sector are purchased through private suppliers, especially the local Pasteur Mérieux affiliate.

As discussed in Section 1.5, the Ministry of Health would like to increase the role of the private sector in the provision of immunization services, as a means of diversifying funding sources in order to target its resources towards the less well-off segments of society.

In addition to the for-profit private sector, a number of NGOs, including the Red Crescent, provide health services and support. Although their role in Morocco in the health sector is still quite small—the MOH estimates that the contribution of local NGOs to overall health financing in Morocco in 1995 was around 0.3 percent—it has been growing in recent years, especially in the areas of family planning and providing support to people with AIDS. A number of associations that deal with chronic diseases, including hypertension and diabetes, have also been formed in recent years and have become active in disease prevention, and health promotion and education. Several charitable organizations also provide some support to the health sector, by helping the indigent or ill, donating equipment to health facilities, and so on.

1.3.2.3 Quasi-Government Sector

The quasi-government sector consists of health facilities run by insurance programs, including the *Caisse Nationale de la Sécurité Sociale* (CNSS), the country's national social security system for private sector employees, and some mutual insurance companies that provide health insurance to employees in the formal private sector. The CNSS, which provides family benefits, retirement pensions, and disability insurance, does not yet provide health insurance. However, it does operate 15 well-equipped polyclinics in large urban areas, which are largely used by people who have private health insurance through their employers or clients who pay out-of-pocket. According to the World

Bank, the CNSS clinic costs are extremely high—higher than private sector costs and, consequently, the clinics operate at a large deficit (World Bank, 1998).

The insurance program for public sector employees—*Caisse Nationale des Oeuvres de Prévoyance Sociale* (CNOPS)—which covers around 11 percent of the population, also runs a clinic and a number of laboratories for outpatient services. Some of the mutual insurance companies that are affiliated with the CNOPS also operate clinics and labs, all in major urban areas. Further discussion on health insurance in Morocco can be found in Section 4.1 and 4.2.

1.4 Morocco's National Immunization Program

1.4.1 History of the Program

Morocco's National Immunization Program (NIP) has become one of the most prominent and highly regarded programs within the Ministry of Health in the past 10 years or so. The program has seen three phases of development. Prior to 1981, most vaccinations were administered during mass campaigns. A 1980 evaluation of vaccination activities showing poor results led to the establishment of the Expanded Program of Immunization in 1981, in accordance with WHO recommendations. During the period of the EPI (1981–1986), immunization coverage rates increased steadily and the incidence of EPI targeted diseases decreased as well, especially polio and diphtheria. However, only an estimated 50 percent of children under one year of age were fully immunized during this period.

Following an evaluation of the EPI, the program was restructured and renamed the National Immunization Program in 1987 in order to reach the WHO objective of 80 percent coverage for all EPI vaccines in children under one year by 1990, established under the worldwide Universal Child Immunization Initiative. With the establishment of the NIP, funding for immunization activities increased and a number of improvements were made and new strategies developed. These include: adoption of the WHO/UNICEF vaccination calendar; establishment of a policy to vaccinate all women of reproductive age with tetanus toxoid (TT); mass procurement and installation of a cold chain infrastructure, financed largely by donors; a nationwide immunization training program for health workers; and the expansion of immunization service delivery to all health centers and dispensaries. A concurrent increase in the number of health centers and dispensaries from around 800 in 1987 to more than 1,900 by 1997 also dramatically increased the number of immunization delivery points nationwide. A national information system was also put in place, including laminated vaccination cards kept by mothers and vaccination registers kept in each health center. As an essential component of the NIP, National Immunization Days were launched in 1987 in order to increase immunization coverage rapidly, especially in the rural areas; they are accompanied by intensive social mobilization, involving people from the King on down. A Scientific and Technical Immunization Committee, consisting of representatives from the public, private, and university sectors, was also established to provide guidance to the MOH in developing strategies, determining new program objectives, and planning and implementing the NIDs. The program also published in 1998, with USAID funding, a comprehensive national vaccination guide as a reference and training document.

Immunization coverage data from surveys show a steady increase in coverage rates between 1987, when the NIP was launched, and 1997, as shown in Table 3. The percentage of children between 12 and 23 months who received all required immunizations rose from almost 70 percent in 1987 to almost 89 percent in 1997. These surveys did not estimate the percentage of children fully immunized by the age of one year—the standard measure of immunization program effectiveness, nor

was the number of valid doses confirmed. However, based on official administrative reports, approximately 91 percent of all children under one year in fiscal 1997/98 were fully immunized.

The 1995 Demographic and Health Survey also estimated that 54 percent of pregnant women had received two doses of TT, up from 46 percent in 1992, and that 60 percent of births in that year were protected against tetanus.

Table 3. Immunization Coverage in Children 12-23 Months in Morocco, 1987–1997

Vaccine	DHS 1987	DHS 1992	DHS 1995	PAPCHILD 1997*
BCG		93.0%	97.6%	
DPT3 and OPV3**		79.0%	89.0%	
Measles		79.0%	88.5%	
Children receiving all EPI antigens (12-23 months)	69.8%	76.0%	85.1%	88.7%
TT2 (in pregnant women)		46.0%	53.6%	

* Coverage data from the Pan Arab Program for the Child (PAPCHILD) survey are still preliminary.

** OPV = Oral Polio Vaccine

Despite the impressive gains in immunization coverage made during the past 10 years in Morocco, the overall rates in rural areas remain considerably lower than in urban areas, as the 1995 DHS data in Table 4 show. While almost 97 percent of all urban children between 12 and 23 months surveyed were reported to have received all EPI vaccinations (although full immunization could not be confirmed), only 78 percent of rural children surveyed had received all basic vaccinations.

Table 4. Immunization Coverage Rates by Urban and Rural Areas, Children 12–23 Months

Antigen	Urban	Rural	Total
BCG	100.0%	96.1%	97.6%
DPT 3/OPV3	98.7%	83.2%	89.0%
Measles	98.0%	82.8%	88.5%
Children fully immunized (12-23 months)	96.7%	78.1%	85.1%

Source: 1995 Demographic and Health Survey

The increase in immunization coverage over the last 10 years has had, as expected, a significant impact on the incidence of vaccine-preventable diseases. According to the NIP, the number of reported new cases of neonatal tetanus declined from 147 in 1987 to 72 in 1988 and to only four in 1997. The reported incidence of pertussis decreased from over 1,000 cases in 1987 to between 37 and 50 per year from 1995 to 1997. The establishment of the NIP seems to have had the most dramatic impact on the incidence of measles; the number of reported cases in 1987, the year the program began, was over 26,000, but declined to one-tenth of that (2,306) the following year, and has remained at between 1,300 and 2,500 for the last three years, an incidence rate of between 4.8 and 9.4 per 100,000 people. The number of reported cases and incidence rates for the EPI target diseases are shown in Table A1 in Annex A for selected years between 1987 and 1997.

1.4.2 Objectives and Main Features of the NIP

1.4.2.1 Objectives

The schedule recommended by WHO and UNICEF and adopted by the NIP consists of one dose of BCG at birth, which is required in order for a child's birth to be officially registered; three doses of DPT between six and 14 weeks; four doses of oral polio vaccine (OPV), including a birth dose; and one dose of measles at nine months of age. The schedule also calls for a total of five doses of tetanus toxoid for women of reproductive age—one dose as soon as possible for all women of reproductive age or as early in a pregnancy as possible, another at least four weeks after the first to fully protect the current pregnancy, and three more over the next year and a half to protect future children.

The current objectives established by the NIP are to:

- ▲ Reach and maintain a 95 percent immunization coverage rate in all areas of the country
- ▲ Eradicate polio before the year 2000
- ▲ Eliminate neonatal tetanus by the year 2000
- ▲ Eliminate measles by the year 2005

1.4.2.2 Delivery Strategies

To reach its objectives, the program uses a number of different strategies to deliver immunizations. The principal strategy is the use of fixed delivery points—health centers, dispensaries, and local hospital outpatient services. Immunization services are offered at these facilities between two and five times a week, with five sessions per week more commonly offered in urban areas. In the two *prefectures* in and around Rabat visited by the study team, all vaccines except BCG and measles, are offered five days a week; the latter two antigens, which require that open vials be thrown out at the end of the day, are offered two times a week. Mainly certified nurses (*infirmières diplômées d'état*) and health assistants (*auxiliaires de santé*) administer immunizations.

To follow up partially immunized children and women, nurses operating out of health centers also make home visits. Health centers periodically check the records of children registered either during visits to the health center or during the NIDs, and have nurses visit them at home to complete their immunizations. Another strategy used in isolated rural areas involves visits by mobile teams consisting, in principle, of a doctor and two nurses, operating from rural health centers. These local visits are organized at the province or *prefecture* level, and depend on the availability of local transport and equipment. The use of mobile teams therefore varies widely from province to province; while they are supposed to make visits to target areas every two months, some teams only make visits once or twice a year, according to the NIP.

A further delivery strategy, which the NIP considers crucial to ensuring high immunization coverage throughout the country, is the organization of National Immunization Days, as described in the following sections.

1.4.2.3 National Immunization Days

As mentioned above, the NIDs began in 1987 as a major strategy to increase immunization coverage nationwide for the six traditional EPI antigens and to increase the population's awareness of the importance of having their children immunized. NIDs are viewed as an opportunity to reach children and women who are not reached by routine services as well as those who have dropped out of the vaccination schedule. The government largely attributes increases in the country's immunization coverage in the last 10 years and maintenance of high coverage levels to the NIDs. The NIP considers these mass campaigns as particularly crucial in improving immunization coverage in the isolated rural areas of the country, where the population's access to health centers is limited and where mobile teams may or may not operate on a regular basis.

The NIDs take place for one week in October each year, with a second round held in November. These campaigns involve intensive social mobilization from the national to the local level, largely funded by donors. The NIDs are truly a national event, where the whole country gets involved. The King gives a speech about the importance of vaccination, the princess plays a role in promoting the campaigns each year, the army often provides logistic support, and school teachers are key in mobilizing women and children to attend the event. Other sectors, such as NGOs like the Red Crescent, and women and youth groups, take part in social mobilization activities. Private health providers in some areas, such as Agadir, assist in organizing the events and administering vaccinations. The NIDs have received considerable support from donors, including Rotary (for OPV and cold chain supplies), UNICEF, and USAID (for social mobilization, vaccine supplies, cold chain equipment, and transport costs).⁴

Polio eradication, as part of the worldwide campaign, has become the focus of the NIDs since 1995. However, these campaigns are still used in Morocco as a strategy to ensure high coverage for all EPI vaccines, as well as for tetanus toxoid for women. Thus, unlike in many countries, all EPI antigens are available during these campaigns.

Table 5 shows the important role that the NIDs continue to play in delivering immunizations in Morocco. As one would expect, nearly 70 percent of all doses of OPV given on average per year for the years 1996 and 1997 were delivered during the NIDs. This is largely because of the target population for the polio eradication program—all children under the age of five—is much larger than the normal target population of under-one year olds that receive immunizations at health centers. More than 50 percent of all vaccine doses administered during the year are given out during the NIDs, much of this is OPV. However, the table also shows that nearly 59 percent of all doses of TT given on average during these years were administered during these campaigns. The NIP, in fact, views the NIDs as the principle strategy to fully immunize all women of reproductive age with TT, especially those who do not have small children and are much less likely to visit health centers for immunizations, and therefore are more likely to have high dropout rates. TT accounted for nearly 25 percent of all vaccine doses delivered during the NIDs in 1996 and 1997. The NIDs are also important as a means of increasing coverage for the other basic EPI vaccines: 20 percent of all doses of DPT delivered in 1996 and 1997, 14 percent of all BCG doses, and 10 percent of all doses of measles were administered during the NIDs.

⁴ Further information on financing of the NIDs is given in Section 4.2.

Table 5. Average Annual Vaccine Usage in 1996 and 1997 during NIDs and Routine Services

Vaccine	Avg. No. of Doses Delivered during NIDs	Avg. No. of Doses Delivered as Part of Routine Services	Avg. Total Doses Delivered per Year	% of Doses Delivered During NIDs
BCG	84,997	505,790	590,787	14.4%
DPT	353,271	1,398,183	1,751,454	20.2%
Measles	149,354	1,288,936	1,438,290	10.4%
Polio	5,282,038	2,271,511	7,553,549	69.9%
TT	1,949,987	1,348,328	3,308,315	58.9%
Overall Doses	7,819,647	6,822,748	14,642,395	53.4%

Source: NIP service statistics

A number of provinces also hold mini-campaigns following the NIDs to update immunizations for women and children. These campaigns normally only involve health personnel and are conducted and managed entirely by local health authorities. In the Rabat/Salé area, for instance, mini-campaigns are held twice a year, in March and in May.

The Ministry of Health plans on continuing the NIDs as local, targeted campaigns to maintain high immunization coverage even once the polio program ends. In fact, as discussed below, Morocco has been selected by WHO as one of 14 countries to participate in a measles elimination program, which will rely heavily on mass campaigns. However, the government needs to decide whether to continue to rely on the relatively resource-intensive and costly NIDs as a major and permanent means of achieving high coverage rates, or whether to concentrate instead on expanding the delivery of routine services, including increasing the number of health centers and dispensaries in rural areas as a more sustainable alternative.⁵

1.4.2.4 The Vaccine Independence Initiative

In 1993, Morocco became the first country to participate in the Vaccine Independence Initiative, a program developed by UNICEF to help countries become self-sufficient in financing their vaccine supply. The VII allows countries to buy vaccines through UNICEF's procurement system using local currency and to pay for them only once the vaccines arrive in country, thereby eliminating two major obstacles—the lack of hard currency and the need to pay in advance—that developing nations often face in purchasing vaccines on the open market. This is made possible by the establishment of a revolving fund at UNICEF headquarters, which in the case of Morocco was capitalized by USAID. The revolving fund is used as a line of credit to cover the lag time between the time the vaccines are paid for in advance by UNICEF in dollars and the country reimburses UNICEF in local currency upon delivery of the vaccines.

Since 1994, Morocco has purchased all of its vaccines through the VII, with the exception of some donor contributions for OPV made in conjunction with the polio eradication program. From 1994 to 1998, the amount of vaccines the government purchased through the VII doubled, allowing it to buy sufficient quantities of OPV to meet the needs of the polio eradication program that became

⁵ The costs of the NIDs vs. the routine program are discussed in detail in Section 3.1.

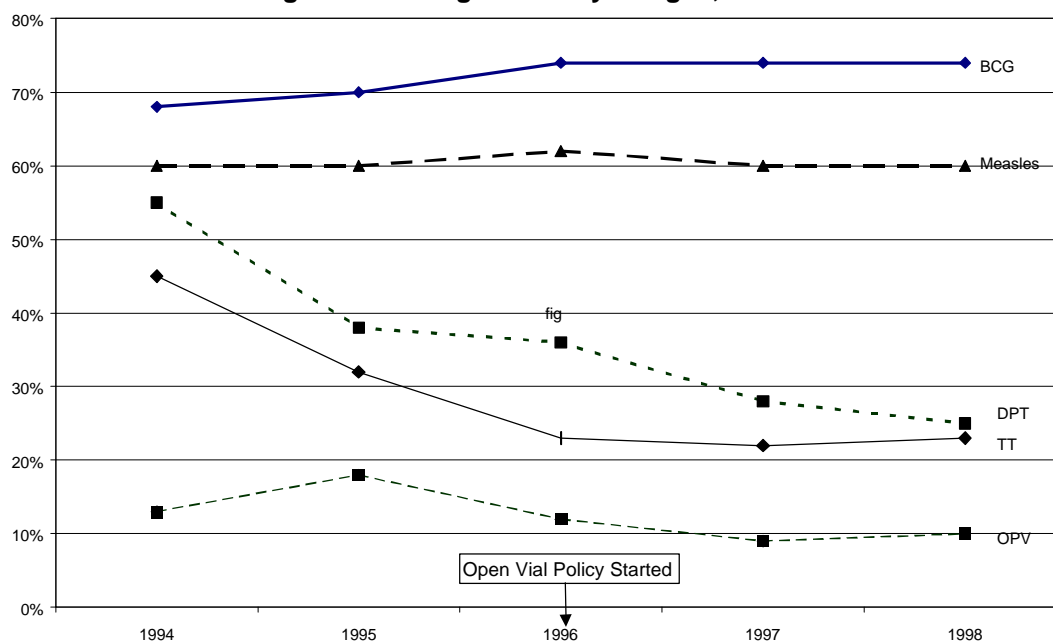
the focus of the NIDs in 1995, and to continue to increase immunization coverage overall. A detailed assessment of the VII in Morocco is given in Section 4.3.

1.4.2.5 Other Recent Developments concerning the NIP

In 1996, the NIP adopted the open vial policy recommended by WHO for all liquid vaccines (all except BCG and measles), in an effort to decrease vaccine wastage. (Before this policy was adopted, any vaccine vials opened during the day had to be thrown out at the end of the day, in accordance with previous WHO/UNICEF protocols.) To be able to apply this policy to OPV, the least heat-stable of the EPI vaccines, polio vials with vaccine vial monitors were procured beginning in 1997. As shown in Figure 2, this policy resulted in the wastage rates of DPT and TT declining from 36 percent to 25 percent and 23 percent respectively between the years of 1996 and 1998.

Another recent development in the NIP has been a concerted effort by the MOH to collaborate with the private health sector to develop joint immunization strategies and goals. Through a series of meetings between private sector representatives and the MOH in 1998, a national vaccination schedule, which includes Hepatitis B, Hib, and measles, mumps and rubella (MMR), to cover both the public and private sectors was developed (see Annex B). The national vaccination guide produced last year was developed as a reference for both public and private providers. Private providers in some areas have also become increasingly involved with the NIDs. As discussed below, the MOH would like the private sector to increase its involvement in the delivery of immunizations, especially for the better-off segment of the population.

Figure 2. Wastage Rates by Antigen, 1994-1998



Vitamin A supplementation was added to the NIDs beginning with the second round in November 1998. The target population is all children nine months to two years old. The dose administered to children is 100,000 I.U. for children nine to twelve months old, and 200,000 I.U. for children 13 to 24 months. An estimated 350,000 children, around half of the target population, were given Vitamin A capsules during the NIDS in November. Capsules for 1998 and 1999 were donated by Helen Keller International and UNICEF. According to NIP staff, supplements have also been

supplied to the country's health centers to be given out routinely as part of the government's strategy to reduce vitamin deficiencies.

1.5 Future Plans and Goals of Morocco's NIP

The MOH is exploring and planning a number of additions, innovations, and other changes to the NIP and to the health sector as a whole. Analysis of how these changes will affect the cost and financing of Morocco's immunization program under different scenarios and assumptions constitutes a major component of this study. The major planned changes that this study will consider are the following:

- ▲ Incorporation of Hepatitis B vaccine into the national program

Since the mid-1990s, the Moroccan government has had plans to incorporate Hepatitis B into the National Immunization Program. Due to the relatively high cost of the vaccine and insufficient funding in the NIP budget, these plans have been delayed. The NIP was able, however, to vaccinate a number of people considered at high risk for Hepatitis B, mainly health workers, prisoners and garbage collectors in the mid-1990s, with a donation of Hepatitis B vaccine provided by Merck, Sharpe and Dohme. Future plans call for vaccinating all newborns, as well as continuing to immunize people in high-risk groups. The NIP had sufficient funding in fiscal 1998/99 to buy 16,300 vials of recombinant DNA vaccine for the first time, through the VII. The program believes that the government will increase its vaccine funding to allow it to introduce Hepatitis B over the next few years. This analysis estimates the cost of the recombinant DNA vaccine for the next five years, if administered to all newborns.

- ▲ Replacement and upgrading of the cold chain system

One of the main achievements of the newly invigorated NIP in 1987 was to equip all health centers and provincial-level (SIAAP) vaccine storage areas with refrigerators, freezers, and other cold chain equipment. As mentioned above, external donors contributed most of this cold chain equipment, and, since then, the government has not provided for the replacement of aging equipment in its NIP budget. Since much of this equipment is now 10 years old or older, the NIP has as one of its major goals to replace much of the existing cold chain equipment within the next five years. To estimate the future costs of updating the cold chain system, the NIP and PHR came up with three possible scenarios for replacing equipment, two of which involve renovating existing cold rooms in Casablanca and Rabat and building several regional cold rooms.⁶ The construction of additional cold rooms in several regions would fit with the government's plans to gradually decentralize the program, along with the rest of the health system (see below).

⁶ At present, all vaccines procured by the NIP are sent to the main cold room in Casablanca. A second cold room, also in Casablanca, serves as a backup in case of power failures. A cold room has been built in Rabat with USAID funding; to date it has not been used, because it lacks a backup facility.

- ▲ Increasing immunization coverage to 95 percent in all areas of the country

Although the overall coverage rate in Morocco is quite high—around 89 percent of all the nation’s children are fully immunized by age 23 months—the NIP acknowledges that there are large differences in coverage rates by area and that a number of the poorer, more isolated, rural areas still have unacceptably low rates. For instance, according to the 1995 DHS, in the Tensif region, immunization coverage rates for children 12-23 months were only 74 percent for DPT3 and OPV3, 69 percent for measles, and only 64 percent for all vaccines—rates more typical of sub-Saharan African countries. A major goal of the NIP in the next several years is therefore to increase the rate of fully immunized children to 95 percent in all provinces and prefectures by concentrating on those areas with low coverage. Because of a lack of data, this study was not able to estimate the additional costs to meet this objective. However, it discusses possible strategies to reach this goal and data requirements to estimate the additional costs required in Sections 5.2.4 and 7.2.

- ▲ Introduction of single-use syringes

At present, many health facilities in the urban areas encourage patients to buy disposable syringes before bringing their children in for immunizations, as a way of ensuring vaccination safety. The NIP would like to introduce single-use syringes into the program nationwide. Two types of single-use syringes are currently available for purchase: regular disposable syringes and auto-destruct syringes. Both syringes require proper disposal; however, the auto-destruct syringes are equipped with disposal boxes for use at the clinic site and cannot be drawn out again after use. Cost projections for introducing both types of syringes are presented in this study.

- ▲ Increased participation of the private health sector in immunization service delivery

The NIP estimates that private sector providers currently immunize around 2 percent of children, who are largely from the more affluent urban population. People often go to private providers to receive vaccinations not available in the government sector, such as Hepatitis B, Hib, and MMR. The MOH would like the private sector to increase its role in delivering immunizations to cover at least 30 percent of the nation’s children, as a means of diversifying the financing of immunizations and reducing the vaccine and delivery costs to the MOH. This increased participation of the private sector in immunization service delivery is more likely to happen if the government’s plans to expand health insurance to cover all formal sector employees and their dependents are realized, and if coverage of preventive health services, including immunizations, is mandated for these insurance plans.⁷

- ▲ Decentralization of the health system

The Moroccan government is in the process of devolving many responsibilities of the central government to the regional level. In 1997, the country was divided into 16 regions and regional and communal councils were elected. If the “regionalization” plans are fully implemented, the regions will be more involved in financing and managing health services in their area, including hospitals as well as basic health services. Regional funding sources will include local taxes and levies, revenue sharing from the national government, as well as grants and subsidies to the poorer regions through an “equalization fund.” The extent to

⁷ See discussion of health insurance plans in Sections 4.1.2 and 6.2.

which the centrally run activities of the NIP will be turned over to and financed by the regions has not yet been fully worked out. However, according to the NIP, it is likely that the maintenance of the cold chain and other technical activities will increasingly become the responsibility of the regions. It is beyond the scope of this study to estimate in detail the cost and financing implications of full regionalization, such as the costs of managing all activities at the regional level, the costs of training regional and local managers, and so forth. However, it does estimate the expenditures required to upgrade the cold chain system under different scenarios, which involve establishing a number of regional cold storage facilities as a likely first step in the decentralization of the immunization program.

- ▲ Other planned health sector reforms

The Moroccan government is currently planning a series of sweeping health sector reforms, with support from the World Bank and other donors. The goal of these reforms is to develop and expand mechanisms for financing health services to supplement current budget allocations, and to expand the role of the private sector in delivering services. In addition to decentralizing the health system, described above, these reforms involve: expansion of health insurance to increase the proportion of the population covered from the current 15 percent to 30 percent; increased fiscal and management autonomy of hospitals and other hospital reforms; and the development of a “solidarity scheme,” in which a publicly financed fund would be established to ensure payment to hospitals for services provided to the poor. The financing analyses presenting scenarios for changing the mix of financing strategies presented in Section 6.3 include scenarios based on these planned reforms, in particular, the expansion of health insurance coverage and the inclusion of immunization and other preventive services in the coverage.

- ▲ Improvements in the disease surveillance, monitoring, and reporting systems

The new draft five-year plan of the NIP includes training of regional and local health personnel and other activities aimed at improving disease surveillance, monitoring, and supervision of immunization activities, and the current management information system (MIS) used for the immunization program. Improving the MIS includes improving the current reporting of routine immunization services to be able to obtain more accurate coverage rates on a regular basis, since current routine statistics are considered inflated. It will also involve improving the tracking and management of vaccines, equipment, and supplies. Plans also call for a number of research studies. An estimate of the cost of these improvements is provided in this analysis.

- ▲ Implementation of a measles elimination campaign

The NIP would like to launch a campaign to eliminate measles in Morocco, with support from the World Health Organization. While planning is still underway, the NIP plans on targeting all children age 11 months to 19 years—an estimated 12 million people. The NIP is considering implementing this ambitious program in three or more phases, perhaps beginning with school children, and then children not in school. This effort will require mass campaigns, as well as mop-up activities. NIP expects to receive considerable donor aid for this program in the form of vaccines, materials, equipment, and technical assistance. Because plans for this activity have not yet been developed, it is not possible to provide estimates of its costs for this analysis.

2. Study Objectives and Methods

2.1 Goals, Objectives, and Research Questions

The goals of this study are to:

- ▲ **Draw lessons learned** concerning immunization financing strategies in Morocco that other countries and the international health community can use in planning sustainable financing of immunization programs with country resources;
- ▲ **Estimate the current and future costs** of the country's immunization program, including the additional costs of introducing new vaccines and other innovations and improvements, both to assist Morocco in planning its program and to update and add to the available information on immunization costs for the global community; and
- ▲ **Provide recommendations** to the Moroccan government on ways to improve its immunization financing strategies for the current program as well as for the introduction of additional vaccines and other innovations or improvements.

The types of current or potential future sources and strategies for financing immunization services that this study considers are:

- ▲ Central government allocations
- ▲ Donor contributions
- ▲ Insurance plans, including employer-based insurance and insurance programs for the poor
- ▲ Local government contributions
- ▲ Cost recovery mechanisms in the public sector, such as fees for vaccination cards or the use of curative care fees to cross-subsidize immunization and other preventive health services
- ▲ Out-of-pocket fees for services in the private sector
- ▲ Various mechanisms for procuring and financing vaccines, including direct procurement on the international open market through a tender and bid process or by negotiating directly with one or more suppliers; participation in the Vaccine Independence Initiative; or procurement from local vaccine producers

The main research questions that this case study will attempt to answer are the following:

Costs

- ▲ What are the annual costs of the current National Immunization Program in Morocco, including both recurrent and capital costs?
- ▲ What are the costs of the National Immunization Days vs. the routine program costs?
- ▲ What are the projected costs of the program for the next five years, including the additional costs of each innovation and change being considered (e.g., introduction of Hepatitis B, replacing the cold chain infrastructure, introducing disposable syringes, etc.)?
- ▲ What are areas for possible cost savings and what degrees of cost savings are possible?

Financing

- ▲ What is the mix of financing strategies that the country has been using to fund immunization services and the procurement of vaccines?
- ▲ How successful have each of these strategies been in terms of:
 - △ securing sufficient funding for immunization services as a whole, and for key components, such as vaccines, cold chain, outreach, in-service training, and personnel?
 - △ maintaining or increasing coverage?
 - △ preventing inequities in coverage (e.g., between urban and rural areas)?
 - △ maintaining or increasing the quality of the vaccination program?
 - △ mobilizing new resources for the NIP?
 - △ encouraging efficient use of resources (e.g., minimizing wastage)?
- ▲ How successful has the VII been in Morocco in meeting the country's vaccine needs?
- ▲ How do immunization financing strategies compare with the strategies used for all other health services? Is the NIP using the full range of financing strategies available in the country's health system? If not, why not?

Financing for the Future

- ▲ What are the projected needs for the next five years to finance the current program as well as the addition of new vaccines and other innovations and changes being considered? What is the projected funding available for the next five years and the projected funding gap?
- ▲ How can Morocco improve upon the current financing strategies and the mix of strategies being used for immunizations in order to be able to develop sustainable financing for the NIP, including the introduction of new vaccines and other planned changes?
- ▲ What are appropriate financing mechanisms for the planned improvements and changes? Can they be funded under current strategies and funding sources or must new strategies be developed?
- ▲ What findings from above are relevant for other countries with similar economic, health financing, and immunization program circumstances?

2.2 Methodology

2.2.1 Data Collection Process and Data Sources

Data for this study were collected mainly during two field visits in Morocco by the joint PHR/WHO team in October 1998 and February 1999. Most of the data collected is national-level data obtained through documents and a series of interviews with key informants.

Data sources for the cost and financing analyses include MOH and NIP budgets and expenditure reports; NIP performance reports; MOH service statistics; detailed MOH reports on the health infrastructure, facilities, etc. (e.g., the 1997 *Repertoire de l'Offre de Soins [Report on the Supply of Medical Care]*); NIP data on vaccine supply, usage, and wastage rates; data from UNICEF on the VII; a cold chain inventory obtained by the NIP; and NIP planning documents. Other planning documents, including the World Bank proposal for a new loan program, documents from the European Union and UNDP, background documents for the government's next five-year development plan, and a draft MOH health sector strategy document provided additional information on both the current and potential financing of the health system. A list of all documents consulted is given in Annex H).

In addition to documents, the PHR/WHO team conducted in-depth interviews and meetings with a large number of key informants. For the cost analyses, the WHO consultant worked closely with the NIP staff, staff of the MOH Division of Planning and Financial Resources, and personnel from the Population Division to obtain information on costs, prices, and resource allocation for immunization services. For information on the current and potential future financing of the health system, as it affects the immunization program, interviews were conducted with MOH personnel; Ministry of Finance personnel; representatives from the private health sector and insurance industry; the local vaccine supplier (Institut Pasteur); members of the technical vaccination committee; and international agencies, including the local WHO office, the World Bank, the European Union, USAID, and UNICEF. The study team also interviewed personnel from two prefectures (SIAAPs) in and around Rabat to obtain more "on-the-ground" information on their immunization activities, costs, future needs, and sources of financing. Two team members also visited a health center in Rabat to discuss their immunization activities with center staff.

Information required to estimate immunization coverage rates and target populations—in order to estimate future vaccine needs—were obtained from census reports and demographic data provided by the Epidemiology Department, as well as from routine EPI performance reports. Demographic and health data were also obtained from the yearly health statistics reports published by the MOH (*Santé en Chiffres*) and survey reports, including the 1992 and 1995 DHS and a MOH survey conducted in 1994 on vaccination coverage and diarrheal disease.

The case study team also held a series of meetings with the NIP staff, the director of the Population Division, and other MOH staff to discuss future plans for the immunization program and to work out possible scenarios and options to be considered for the cost and financing projections.

2.2.2 Costing Methodology

The focus of the cost analysis for this case study is on the costs of the program to the government of Morocco. Therefore, this analysis does not try to estimate costs to the users of the immunization program, such as costs of travel to a health facility and so forth. The study concentrates instead on what the Ministry of Health and its partners currently spend, and will need to spend in the future, to provide immunization services with acceptable levels of quality and coverage. The costs of resources provided by the government from sectors other than health have been considered only for the National Immunization Day cost analysis. There may be some input from the community in organizing routine immunization activities and/or providing messages about immunization, but since these costs are not borne by the government, they are not included in this analysis.

This analysis is a cost estimation using existing data. More refined work on costs could have been done if it had been possible to collect primary data during this study's timeframe. This cost exercise uses a mix of available expenditure, budget allocation, and cost information in order to approximate the total annual costs of the NIP. However, expenditures specifically for immunization activities were very difficult to identify among MOH budget lines. Therefore, this study does not attempt to estimate current program expenditures by the MOH. Instead this analysis estimates the costs of the program—whether they are borne by the MOH or by other organizations. The costs of donated items were included whenever documented amounts and costs were available; not all donations, particularly for items donated more than five years ago, are accounted for in this costing analysis. The cost estimates presented here are therefore indicative of the levels of costs and the relative costs of particular components.

More details on the costing methodology are provided in the Section 3 and in Annex C.

2.2.2.1 Description of Variables

Recurrent Costs

- ▲ *Recurrent costs*: those expenses associated with inputs that will be consumed or replaced in one year or less. For the purpose of this case study, it is the annual recurrent costs that are of most interest to the program, in terms of financial planning. Throughout the cost analysis, an exchange rate of US\$ 1 = DH 9.7 is used. *The Economist's* country reports for Morocco illustrate a very stable dirham against the dollar since 1996, and predict few exchange rate fluctuations, though a slight increase to 9.8 through 1999 (Economist Intelligence Unit, 1998).
- ▲ *Personnel*: includes the salaries and benefits of staff involved in the management and provision of immunization services, including MCH nurses, who actually administer the vaccinations, and health assistants. Physicians at the service delivery points play a minor role in supervising the MCH nurses. At the local (prefecture) level, there are dedicated NIP coordinators who are involved with all aspects of NIP management and operations. Central-level NIP management salaries are also included.

- ▲ *Vaccines*: includes the costs of vaccines based on reported stock deliveries, usage, and calculated wastage. Information on actual expenditures for vaccines in 1997/98 was also obtained from UNICEF and the NIP for vaccines purchased through the Vaccine Independence Initiative.⁸
- ▲ *Supplies*: this includes items such as needles, syringes, information, education and communication (IEC) materials, parts for sterilization and cold chain equipment, vaccination cards, and ice packs.
- ▲ *Transport*: includes maintenance and fuel involved with vehicle use by the Ministry of Health for the delivery of immunization services.
- ▲ *Maintenance and Overhead*: includes overhead costs, such as electricity, water, and telecommunications use, as well as maintenance of cold chain equipment
- ▲ *Short-term training*: consists of short-term, in-service training for NIP activities for any type of health staff involved.

Capital Costs

- ▲ *Capital Costs*: the annual costs of resources that have a useful life of more than one year; i.e., they are not consumed or replaced every year. The purchase cost of capital goods such as equipment or buildings (also called capital investment) is distributed across the estimated useful life of the investment item, taking into account the discount factor, which indicates the opportunity cost of having money tied up in capital. This process is called amortization, or annualization. For the purpose of this cost analysis, a discount factor of 5 percent was used, based on discussions with the MOH Division of Planning and Financial Resources, and recommended cost analysis conventions (Brenzel and Claquin, 1994; Brenzel, 1991; Creese and Parker, 1994).
- ▲ *Buildings*: involves an allocation of the value of the share of facility space devoted to immunization activities, based on the estimated replacement value.
- ▲ *Equipment*: includes cold chain and sterilizing equipment, as well as computers purchased by the NIP.
- ▲ *Vehicles*: involves the type and numbers of vehicles used by the Ministry of Health for immunization activities.
- ▲ *Long-term Education/Training*: includes long-term education, with or without a degree, that is provided either to current NIP staff or in the past through the NIP budget to staff who are no longer with the program.

⁸ Discrepancies between expenditure data from the different sources prevented the use of expenditure data in this analysis. These discrepancies may be explained by the changes in the fiscal calendar made in 1996, the lack of documentation of donated vaccines over the past four years, and/or the mismatch between the fiscal calendar of the expenditure data and the calendar year used by the program for activity reporting.

2.2.2.2 Calculating Future Vaccine Needs

Vaccine needs for the next five years were estimated using the population-based method, as described in Section 6.1. In order to do this, researchers estimated target populations using the official global projected figures from the last census and demographic indicators (crude birth rate, infant mortality rate), given by the MOH Department of Statistics. Immunization coverage rates were then recalculated antigen by antigen, by region, urban or rural settings, and by type of delivery strategy (fixed or mobile). To calculate future vaccine needs, the current vaccination schedule and policy is assumed, as is coverage rates of 100 percent. Wastage coefficients based on vaccine wastage data provided by the NIP for each antigen were then applied to the resulting figures.

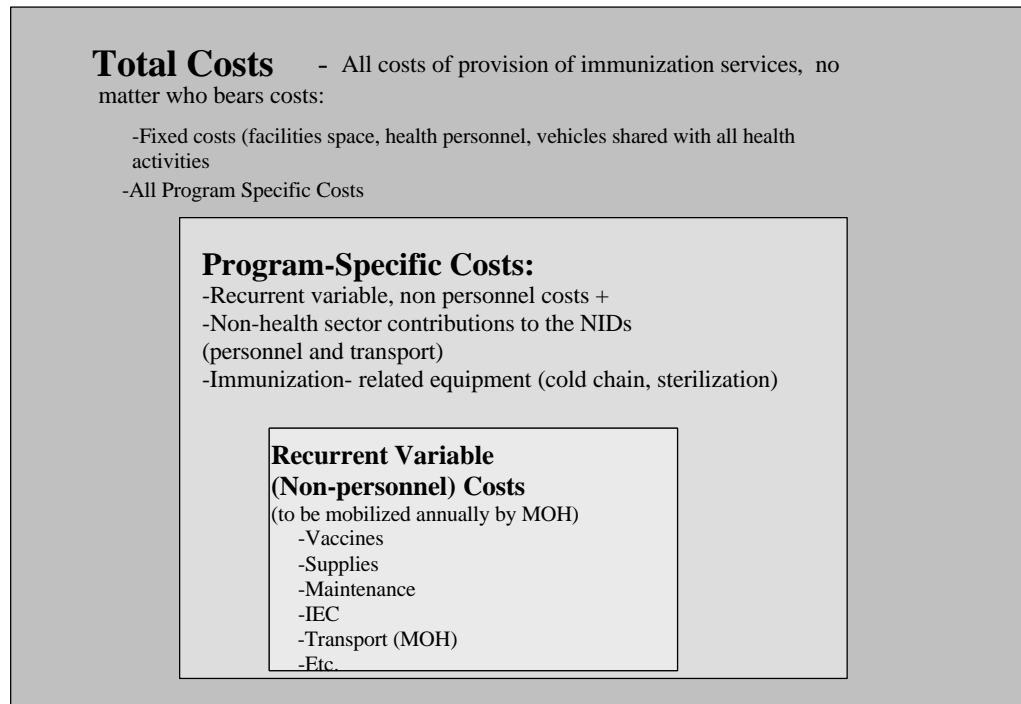
2.2.3 Financing Analysis Methods

For this study, estimated costs are used as a basis for the financing analysis, as opposed to expenditures. This allows accounting for all resources to the program, several of which would not appear in expenditure reports, including in-kind contributions from communities and from other (non-health) sectors, donor contributions of materials and equipment, and personnel time. Since the cost analysis required a number of assumptions, the same cautions that apply to the cost analysis should be taken in interpreting the results of the financial analysis.

To estimate what share of the costs were financed by the various funding sources, we relied on available government budgets, information from the MOH, and estimates provided by key informants within the NIP, the Planning and Financial Resources division of the MOH, and other key sources.

Three different types of costs are distinguished for the financing analysis. The first is the *total estimated costs* (see Figure 3) of running the NIP, no matter who bears these costs. Total costs include the proportion of capital costs—health facilities, vehicles, equipment, etc.—that are estimated to be used for immunization services, as well as the estimated cost of health personnel that go towards providing immunization services. Estimating the total costs allows governments and the international health community to determine what proportion of total health care costs or the MOH budget is used for immunization services. They also present a complete picture of what funding sources are contributing to the NIP program and to each component. In addition, the total estimated cost also is used to obtain cost-effectiveness measures, such as cost per dose, cost per capita, and cost per fully immunized child (FIC), which governments and the international health community can use in assessing different delivery strategies (e.g., mass campaigns vs. routine services) and in making comparisons across countries, where appropriate.

Figure 3. Types of Immunization Program Costs Analyzed for the Morocco Case Study



The second types of costs are the “*program-specific*” costs of the immunization program. These include only the costs that are incurred specifically for the delivery of immunization services, over and above the costs shared with other health activities, and regardless of who pays for them. Thus, NIP program-specific costs exclude health personnel costs and capital costs, such as health facilities space and government vehicles, since these costs are shared with other MOH programs and would be incurred by the MOH with or without the NIP. Program-specific costs include all recurrent variable costs required to provide immunization services, such as vaccines; syringes, needles and other vaccine supplies; transportation costs for both the National Immunization Days and routine services; maintenance and overhead costs; and IEC/social mobilization costs that are related to the immunization program. Since program-specific costs are all the costs required to run that specific program—no matter which entity incurs these costs—they also include contributions from sectors other than health for the NIDs, such as government personnel (soldiers, teachers, etc.) who take part and transportation provided by other government ministries during these campaigns. Also included is the cost of immunization-related equipment, that is, cold chain and sterilization equipment. Program-specific costs are useful to MOH and NIP managers in determining exactly what it costs specifically to provide immunization services and in planning program changes, such as how to eventually replace the NIDs and who will bear these costs. For the analysis of current financing of the program (Section 4), this report presents the financing picture both in terms of *total costs* and *program-specific costs*.

A third set of costs is the *recurrent, variable, non-personnel costs* that the MOH must mobilize each year for the NIP, either from its own budget or from donors. These costs are most useful to the MOH in planning the financing of the NIP. They include vaccines, syringes and other supplies, and other recurrent costs, such as maintenance, transportation costs incurred by the MOH, IEC, and short-term training. They exclude personnel costs, since health personnel are shared with other health programs, and all contributions to the NIDs made by other sectors (e.g., personnel time and

transportation costs), since these costs are not borne by the MOH. They also do not include equipment costs, since they do not constitute regular operating costs that the government must pay for each year. This analysis uses these costs as the basis for estimating the additional costs of, and financing required for, future planned improvements, such as introducing Hepatitis B into the program and improving the cold chain system (Sections 5 and 6). They are also used as the basis for the possible future financing scenarios presented in Section 6.

This analysis of immunization financing considers mainly the MOH point of view. The MOH would like to know: (1) the value of resources mobilized by the MOH (including those from other sectors); (2) the financing needs of the MOH for immunizations under different options; and (3) the costs to the MOH as input into it negotiating position with the Ministry of Finance and other partners for resources to run the NIP.

2.2.4 Study Constraints and Limitations

This study was able to estimate the total, program-specific and recurrent, variable (non-personnel) costs of the NIP in Morocco, mainly based on national-level data. It also was able to estimate the amount of funding for the program provided by each funding source, based on the estimated costs, again using national-level data. This permitted researchers to project future costs of the program with planned improvements and changes, and to come up with possible new scenarios for financing the program that involve reducing cost, phasing in planned changes, changing the mix of financing sources, and mobilizing additional resources.

As with all studies, there were a number of constraints and limitations that should be taken into account when interpreting the results. First, the study team originally planned to conduct local surveys in selected provinces to supplement the national-level data with detailed information for the cost analysis on their immunization activities, use and allocation of resources for immunization activities, and the implementation of the NIDs, as well as on financing sources. Because of bureaucratic difficulties and personnel constraints, these local studies could not take place during the limited time allotted for the study. Interviews of personnel from two Rabat area prefectures, did, however, provide some useful information for the cost and other analyses. The lack of local-level data made it difficult to allocate to the immunization program resources and costs shared by different health activities, including personnel, vehicles, and supplies, and to accurately determine the specific costs of the NIDs. Consequently, the costing specialist made a series of assumptions on resource use and allocation, based on input from the NIP staff and the personnel visited in the two Rabat-area prefectures. Without local-level data, it also was not possible to include all of the costs of mobile health teams who provide immunizations to populations with limited access. This may result in an underestimate of the true costs of routine services, though most persons consulted assumed the use of these mobile teams to be rather limited and irregular, and thus their contribution to the total routine and program costs is likely to be relatively small.

Limited local-level data also made it difficult to estimate the contribution of non-MOH financing sources for immunizations, including out-of-pocket fees to private providers, insurance programs, and cost recovery activities in the public sector (such as charging for vaccination cards). In particular, the insurance companies, both public and private, did not have records for immunization activities and could not provide information on the extent to which immunization services are covered by various programs and reimbursement rates. For the financing projections, the study team therefore made estimates on the potential contribution of these sources based on partial information, which were validated by key informants. It was also not possible to estimate the contributions of donors made directly to districts and other sub-national levels for this analysis.

Data limitations and the fact that plans are still being developed also made it impossible to provide meaningful cost projections for some of the planned additions and changes to the NIP program, including increasing immunization coverage to at least 95 percent in all areas, implementing a measles elimination campaign, and decentralizing the health system and the implications for the NIP program. Further research is therefore needed to estimate the costs of these program improvements.

Another constraint involves estimating the number of children fully immunized by age one for a given year, which is needed to estimate the cost per FIC, a standard measure of the cost and cost-effectiveness of immunization programs. Estimates of FIC are often based on findings from population-based surveys, since coverage rates obtained through routine reporting are often inflated, as is the case in Morocco. However, no recent surveys carried out in Morocco include estimates of FIC, and thus the researchers had to rely on the routine administrative reports provided to the MOH to come up with an estimate. Therefore, the cost per FIC figures estimated in this report should be interpreted with caution.

3. Current Costs of Morocco's Immunization Program

This section estimates both the *total estimated costs* of the National Immunization Program for fiscal 1997/98 as well as the *recurrent, variable, non-personnel costs* to the MOH that are used as the basis for the cost and financing projections shown in Sections 5 and 6.

Total estimated costs are broken down into capital and recurrent costs. As explained in Section 2.2.3.1, capital costs are the annual costs of resources that have a useful life of more than one year. They include the use of building space and vehicles for immunization services, cold chain and other immunization-related equipment, and long-term training. Recurrent costs are the costs of inputs, such as vaccines, supplies, maintenance, and transportation, that are consumed or replaced in one year or less.

For the analysis of total estimated costs, both variable costs and fixed costs are included. Variable costs are those that change as the volume of service changes. This includes those costs that are expected to change as the NIP in Morocco undertakes new strategies for increasing coverage and for improving the quality of services. Therefore, variable costs are considered to change as the volume of immunization services increases, and as the program expands the range of available vaccines, or introduces new technologies. Depending on the particular scenario, variable costs include vaccines, supplies, transport, cold chain equipment, and short-term training.

Fixed costs are costs that remain the same regardless of changes in the program or in the volume of immunization services provided for a certain period of time and up to a certain level of services or activities. The fixed costs in this analysis are the costs of the space in health facilities used for immunization activities, the cost of personnel who deliver immunization services (mainly MCH nurses and health assistants), and the cost of vehicles used for vaccine delivery and for other immunization activities. These costs are considered fixed, since the number of personnel delivering immunization services or the number of vehicles used for NIP-related activities is not likely to change as immunization services expand or as the program otherwise changes, up to a certain limit and for a certain period of time.

This analysis also estimates both the costs of the “routine” immunization program and the additional costs of the National Immunization Days. The routine program involves the delivery of immunization services at health centers and other “fixed” delivery points on a routine basis, as well as other regular immunization activities, such as home visits. The additional costs of the NIDs are included in this study, because of the MOH’s interest in knowing what these campaigns cost. The MOH is particularly interested in knowing how cost-effective these campaigns are, since they are a major means used by the program to achieve high coverage rates for all vaccines—not just polio—especially in the rural areas. To estimate the total current costs of the immunization program for this analysis, the costs of the NIDs and the costs of the routine program are added together.

3.1 Total Estimated Annual Costs of the NIP

3.1.1 Total Estimated Costs of the Routine Immunization Program

The costs of the routine program consist of both the recurrent costs and capital costs. Estimated costs for fiscal 1997/98 were used as the basis for determining recurrent costs. More details on the methodology and data used to obtain these estimates can be found in Annex C.

3.1.1.1 Recurrent Costs

As explained above, the recurrent costs of the NIP include the cost of personnel, vaccines, transport costs such as fuel and vehicle maintenance, supplies, short-term training of health personnel related to immunizations, social mobilization activities, and maintenance and overhead. Below is a brief description of how each of these costs was estimated.

The estimate of personnel costs (Table C1 in Annex C) is based on approximations of the amount of time that health staff spend on immunization activities, made by NIP central-level managers, province-level NIP coordinators, and a few health staff themselves during interviews for this case study. The doctors posted at the primary health care level who are involved with immunization activities were estimated to spend 2 percent of their total time on immunizations, mainly for the supervision of nurses. The MCH nurses who actually deliver vaccinations were estimated to spend 20 percent of their total time on immunization activities, as were the aides at the primary health care level. Also included are the province-level NIP coordinators, who spend 100 percent of their time on NIP activities. Central-level staff time, including NIP program staff and management of the MCH Division (under which the NIP program falls), is also included. Salary information from 1997 was obtained from the MOH Division of Planning and Financial Resources, as salaries are paid from the general health budget. The total estimated costs of personnel per year are around DH46 million or US\$4.5 million.

Vaccine cost estimates are based on the actual number of doses delivered in 1997 through routine program channels. Vaccine prices for 1997/98 were obtained through the Vaccine Independence Initiative. They include shipping, handling, and a 10 percent buffer for loss and breakage (Table C2 in Annex C). This method most closely reflects the true cost of vaccines, since it represents the amount of vaccine actually consumed, whether by recipients or by wastage. However, it is important to remember that this estimate is based on actual usage, not purchases of vaccines.⁹ The total estimated cost of vaccines for the routine program in 1997/98 was \$1,287,163.

Recurrent transportation costs include the cost of fuel and maintenance of vehicles used for immunization activities. Complete information was not available since the relevant information is not routinely reported by the various MOH activities. To make an estimate would require manually tabulating individual requisitions for the use of government vehicles at the provincial and prefecture level over the past and then allocating these requisitions to immunization activities, which was beyond the data collection scope of this study. Instead, it has included the routine line item for fuel from the NIP budget, as well as the costs of transporting vaccines from the port to the central cold

⁹ As explained in Section 6.1.1, more vaccines are bought each year than are consumed, with the difference at least partly accounted for by stock surpluses. Therefore, basing vaccine costs on usage rather than on amount purchased gives a more accurate estimate of the true vaccine expenditures.

room in Casablanca, and from central cold room to the provinces. The estimated total annual transportation costs for the routine program obtained using this method are \$26,438.

The supplies category includes items such as needles, syringes, IEC materials, parts for sterilization and cold chain equipment, vaccination cards, registers, and ice packs. Data were obtained from the NIP budgets for 1995–97/98. Annual cost estimations were made based on average purchases made over the past three years and the 1997 unit prices provided by NIP program. The estimated total cost per year is \$91,669.

Short-term training includes periodic refresher training for health personnel assigned to immunization service delivery. Interviews with NIP managers and review of the budgets showed that training does not take place every year, but only when a new aspect added to the program, in such cases the training is usually arranged and provided by a donor organization. An estimate of short-term training costs was based on past patterns and cost levels shown in the NIP budgets.

Maintenance and overhead includes maintenance of the cold chain equipment, which is estimated at 2 percent of the annualized costs of major cold chain equipment (freezers and refrigerators only, not vaccine carriers, etc.), and an 8 percent allocation of the annual electricity, water, and communications expenditures made by the MOH at primary care facilities. Except for the cold chain data, information on overhead was extracted from the actual expenditures recorded in the MOH budgets. The total estimated cost comes to \$181,172 per year.

3.1.1.2 Capital Costs

Capital costs of the immunization program consist of the cost of the space in health facilities allocated for immunization services; the cost of cold chain equipment, including cold rooms, refrigerators and freezers; the cost of vehicles used for immunization activities; and the cost of long-term training. Each of these is explained below.

The estimated annualized cost of building space allocated for immunization services is derived from the 1996/97 actual MOH expenditures for the construction of all new facilities where immunization activities take place (i.e., rural dispensaries, rural health centers, urban health centers, and rural and local hospitals). The estimates of space allocated towards immunization activities for each type of health facility were derived from recommended minimum sizes of primary health care facilities, per the MOH, and input from NIP managers. A depreciation rate of 5 percent was used. The total annualized cost of building space for immunizations is estimated at \$935,647.

Equipment costs include sterilizers for needles and syringes, as well as cold chain equipment. Cold chain equipment consists of the central cold rooms, major equipment such as different types of refrigerators and freezers, as well as cold boxes and vaccine carriers. The estimates consider only equipment less than five years old, using the original purchase prices (1991 UNICEF prices) (see Tables C4 and C5 in Annex C). Data on the equipment types, numbers, and age were obtained from the 1996 cold chain inventory conducted by the NIP.¹⁰ The total estimated current cost of equipment comes to \$289,313.

¹⁰ Although this inventory was acknowledged by the NIP managers to provide inadequate information for comprehensive planning and cost estimation purposes, it was used for these cost estimates because of a lack of any other existing information on the cold chain. This lack of in-depth or precise knowledge about the current status of the cold chain at the central level is primarily due to the fact that most of the cold chain equipment has been donated by external funders.

An estimate of the annual costs of vehicles was made based on an estimation of the number and type of vehicles used by the MOH and an estimate of the percentage of time that these vehicles are used for immunization activities (see Table C6). The total estimated annualized cost of vehicles for the immunization program is \$57,498.

Long-term education and training is viewed as a long-term investment in the program. To date, only one current central-level NIP staff member has received such training. The estimated annual cost of this training, amortized over two years, is \$8,510.

3.1.1.3 Total Annual Costs of the Routine Program

The estimate of total annual costs of the routine program for fiscal 1997/98 is shown in Table 6. The routine program costs an estimated \$7.6 million per year. Recurrent costs account for 83 percent of the total and capital costs make up 17 percent. Personnel is by far the largest cost category, accounting for 62 percent of total routine program costs. Vaccines account for almost 17 percent of the total costs.

Table 6. Estimated Total Annual Costs of the Routine Immunization Program, 1997–98

Cost Component	Estimated Cost (US\$)	% of Total
Capital Costs		
Building Space	\$935,646	12.2%
Vehicles	57,499	0.8%
Equipment	289,313	3.8%
Long-term Education/Training	8,510	0.1%
Sub-Total	\$1,290,968	16.9%
Recurrent Costs		
Personnel	\$4,750,467	62.0%
Vaccines	1,287,163	16.8%
Supplies	91,669	1.2%
Transportation	26,438	0.35%
Short-term Training	2,896	0.04%
IEC and Social Mobilization	17,293	0.2%
Maintenance and Overhead	181,172	2.4%
Sub-Total	\$6,357,198	83.1%
Total Annual Costs	\$7,648,166	100%

3.1.2 Costs of the National Immunization Days

As mentioned above, National Immunization Days (NIDs) involve many different sectors, including the armed services, educators and NGOs among others. In addition, over the years a number of international donors, such as Rotary International, USAID, and UNICEF have contributed materials, vaccines, and money to the NIDs. Since many resources come from outside of the Ministry of Health and are provided free and often on an *ad hoc* basis, it is difficult to fully cost the NIDs. However, in planning for the NIDs every year, the NIP develops action plans for inputs that will be needed to reach program targets, and divides some of these inputs according to health sources (from

the MOH budget) and non-health sources (from other government budgets). Based on these annual NID plans and the performance reports for the NIDs for the past two years, the study team estimated the annual additional costs of the NIDs.

The methods, assumptions, and limitations involved in costing out the NIDs include the following:

- ▲ Personnel costs were based on 15 days of planning and 10 days of administering vaccinations. During the NIDs, some health personnel who are not normally involved with immunization activities, especially non-MCH nurses, contribute their time. According to NIP managers, health directors at the province level and several MCH nurses, other MCH services continue to be provided during the NIDs, but to a lesser extent. Non-health government employees involved in the NIDs are mostly support staff, such as drivers. Without an in-depth study of personnel time distribution for both routine and NID immunization activities, personnel costs had to be based on this informal input. Only the value of the time that health staff spend in addition to their time on routine immunization activities is included in the calculation of NID personnel costs.
- ▲ Vaccine costs were based on the average number of doses given, the average price per vial, and the average wastage rates observed during the 1996 and 1997 NIDs. Since there are no data on NIP performance without the NIDs, the study had to assume what would happen to the vaccines administered during the NIDs, if the NIDs were not held. Given the coverage gains attributed to the NIDs, and their role in capturing people normally missed by the routine program, especially in hard-to-reach rural areas, it is assumed that none of the vaccines administered during the NIDs would have been given during routine immunization activities. This assumption means that the estimate of the vaccine costs of the NIDs may be slightly overstated.¹¹
- ▲ There were no data on the use or costs of supplies for the NIDs. Therefore, the study team made an estimate based on the proportion of the total costs of the routine program that are absorbed by supplies (around 7 percent).
- ▲ No additional capital costs were included in the estimates of the NIDs, because no available information showed that additional cold chain equipment was used or bought for the NIDs. Additional facilities are used to deliver immunizations during the NIDs. However, there is no information available on the parameters for distributing these overhead costs and for the additional overhead costs. Therefore, these inputs were not included in the cost estimate of the NIDs.
- ▲ Vitamin A supplementation began during the November 1998 NIDs and is likely to continue during future NIDs. Cost estimates were based on the number of doses used and market prices.
- ▲ Transportation cost estimates were based on the amount of fuel planned for use during the NIDs. The data on the amount of fuel required is divided in the annual plans between health and non-health budgets. Current market prices for fuel were used. Since there are no data on the actual consumption of fuel, it was assumed that all fuel planned to be used actually was used during the course of the NIDs.

¹¹ If in fact, some vaccines used during the NIDs would have been used for routine services if there were no NIDs.

- ▲ The estimated cost of social mobilization for the NIDs, which is a key to their success, includes only the costs of mobilization activities performed by health personnel, and the value of donations to the health/NIP budget made by international organizations specifically for these activities. The contribution to social mobilization activities by sectors outside of health, such as schoolteachers, NGOs, and others, could not be estimated due to a lack of data. Therefore, the true costs of social mobilization for the NIDs are underestimated in this analysis.

Keeping these data limitations in mind, the estimated additional cost of the NIDs for fiscal 1997/98 is around \$3.5 million per year. This total, broken down by health sector and non-health sector costs, is shown in Table 7. As with the routine program costs, personnel is the largest cost component, accounting for 55 percent of the total estimated cost of the NIDs. Vaccines, as expected, account for a larger proportion of total NID costs (26 percent) than of routine program costs. Together, personnel and vaccines account for 81 percent of total NID costs. Transportation costs, at 14 percent, are also much higher for the NIDs than they are for the routine program, where they are less than 0.4 percent of total costs. Again, it must be kept in mind that the personnel and social mobilization inputs from non-health sources are underestimated, and that overhead costs are not included, all of which affects the total cost incurred for each cost component.

Comparing the contributions of the health sector and other sectors, these estimates show that 77 percent of the total NID costs are borne by the health sector and 23 percent by other sectors, though, again, the non-health sector contributions for social mobilization are not included in this estimate. Non-health sectors make a significant contribution in terms of personnel, paying for at least 22 percent of these costs. Non-health sectors also absorb most (78 percent) of the estimated transportation costs for the NIDs. This is important when considering the financing and sustainability of the NIDs as a strategy to improve and/or maintain high immunization coverage.

Table 7. Estimated Annual Additional Costs of the National Immunization Days, 1997/98

Cost Component	Costs of Health Sector Inputs		Costs of Non-Health Sector Inputs		Total Additional Costs		% of Total Additional Costs
	Amount (US\$)	%	Amount (US\$)	%	Amount (US\$)	%	
Personnel	\$1,541,536	78.3	\$426,052	21.7	\$1,967,588	100.0	55.2
Vaccines	930,520	100.0	0	0.0	930,520	100.0	26.1
Supplies	66,067	0.0	100.0	0.0	66,067	100.0	1.8
Vitamin A	14,736	100.0	0	0.0	14,736	100.0	0.4
Transport	111,332	21.9	396,894	78.1	508,226	100.0	14.3
Social mobilization	78,000	100.0	0	0.0	78,000	100.0	2.2
TOTAL	\$2,742,191	76.9	\$822,946	23.1	\$3,565,137	100.0	100.0

Source: NIP Administration; MOH Division of Planning and Financial Resources

3.1.3 Estimated Total Costs of the NIP

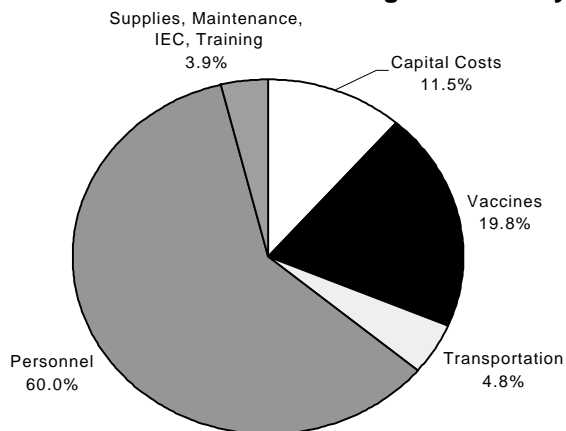
The total estimated annual costs of the NIP, including both direct and indirect costs for the routine activities and the National Immunization Days, are around \$11 million per year, or about DH109 million (see Table 8).

Table 8. Estimated Total Costs of the National Immunization Program, 1997/98

Cost Component	Routine Program Costs (US\$)	NID Additional Costs (all sectors) (US\$)	Total Program Costs (US\$)	% of Total
Capital Costs				
Building Space	\$935,646	0	\$935,646	8.3%
Vehicles	57,499	0	57,499	0.5%
Equipment	289,313	0	289,313	2.6%
Education/Training	8,510	0	8,510	0.08%
Sub-Total	\$1,290,968	0	\$1,290,968	11.5%
Recurrent Costs				
Personnel	\$4,750,467	\$1,967,588	\$6,718,055	59.9%
Vaccines	1,287,163	930,520	2,217,683	19.8%
Supplies	91,669	66,067	157,736	1.4%
Vitamin A	14,736	14,736	14,736	0.13%
Transportation	26,438	508,226	534,664	4.8%
Training	2,896	0	2,896	0.03%
IEC/Social Mobilization	17,293	78,000	95,293	0.85%
Maintenance/Overhead	181,172	0	181,172	1.6%
Sub-Total	\$6,357,198	3,565,137	9,922,235	88.5%
TOTAL	\$7,648,166	\$3,565,137	\$11,213,203	100.0%
Percentage of Total Costs	68.2%	31.8%	100.0%	

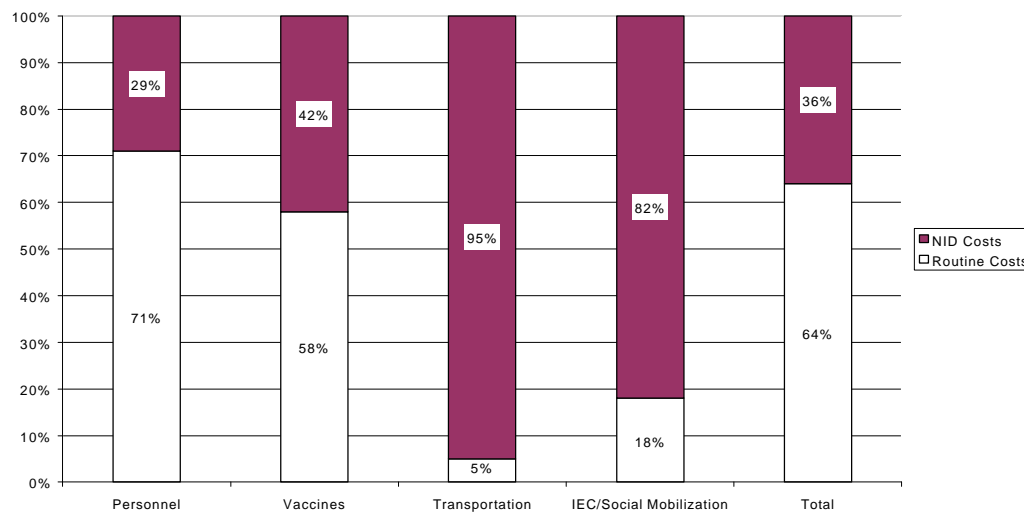
Approximately \$1.3 million (11.5 percent) are capital costs, including building space and cold chain and other equipment. Recurrent costs, such as personnel, vaccines, and transportation, make up 88 percent of the estimated total costs. The largest cost items are personnel, which accounts for 60 percent of total costs, and vaccines, which account for nearly 20 percent. Cold chain and other equipment make up only approximately 2.6 percent of total program costs. The percentage breakdown by cost category is illustrated in Figure 4.

Figure 4. Breakdown of Total Immunization Program Costs by Component, 1997/98



In looking at the proportion of total costs consumed by the NIDs vis-a-vis the routine program, about 32 percent of total program costs are spent for the NIDs, most for personnel, vaccines, and transportation. As shown in Figure 5, almost 30 percent of all personnel costs are spent on the NIDs, though this includes non-health sector personnel costs, which made up around 20 percent of total estimated NID personnel costs. Forty-two percent of all vaccine costs are consumed during the NIDs, which is not surprising given that more than 50 percent of all vaccine doses and 70 percent of all polio doses are administered during these campaigns (see Table 5). Nearly all estimated transportation costs (95 percent) are also used during the NIDs, which involve extensive outreach activities throughout the country. Most IEC and social mobilization costs (around 82 percent) are also related to the NIDs. Again, it must be kept in mind that certain NID-related costs, especially those from non-health sectors, including personnel and social mobilization are underestimated, and thus the true cost of the NIDs and their proportion of the total cost of the immunization program are higher than these figures indicate.

Figure 5. Breakdown of Total Program Costs by Routine Immunization Activities vs. NIDS, by Selected Components, 1997/98



3.1.4 Unit-Cost Estimates for the NIP

Using the immunization cost estimates, the study team estimated the standard cost-effectiveness measures used for immunizations, including cost-per-dose administered, cost per fully immunized child, and cost per capita (see Table 9). The overall cost-per-dose of the program is estimated at \$0.77. This compares to a cost-per-dose estimate of between \$0.49 and \$0.70 found in a recent study in Bangladesh (Khan and Yoder, 1998). The cost-per-dose delivered during the NIDs was found to be less than half of that estimated for the routine program (\$0.45 vs. \$1.12), which suggests greater efficiency of the NIDs as a vaccine delivery strategy. This is counterintuitive to the higher cost per FIC for campaigns found in other studies. Some of this may be due to the underestimation of social mobilization costs, both in terms of health and non-health contributions, and the underestimation of non-health personnel costs. A prospective study of NIDs in China (Jian, 1998), for instance, found that “publicity” accounted for 31 percent of the total costs of the NIDs, whereas social mobilization in this study was found to contribute only 2 percent of total NID costs.

Table 9. Cost-Effectiveness Estimates for Morocco's National Immunization Program, 1997/98*

Measure	Output	Cost-Effectiveness Ratio (US\$)
Number of doses administered:		
During routine activities	6,822,748	\$1.12 per dose
During NIDs	7,819,647	\$0.45 per dose
Total	14,642,394	\$0.77 per dose
Children fully immunized by age 12 months (FIC)	536,692	\$20.89 per FIC
Children fully immunized by age 23 months (Crude FIC)	598,492	\$18.73 per CFIC
Per capita cost of immunizations	28,000,000	\$0.40 per capita

Sources: NIP program; MCH Division, GOM, 1996

*Based on the total estimated program cost of \$11,213,203 per year.

To obtain estimates of cost per fully immunized child, administrative reports of the number of children fully immunized before 12 months of age was used to approximate FICs, and the number of children fully immunized between 12 and 23 months was used to approximate the additional crude FICs (CFICs).¹² The cost per FIC obtained was around \$21 and the cost per CFIC was found to be almost \$19. The overall cost of the program per capita was estimated at \$0.40.

These estimates are somewhat high compared to estimates obtained in other countries. For example, studies conducted during the 1980s found a range of \$5 and \$15 per FIC; later studies found a range from \$10 and \$20 (Brenzel & Claquin, 1994; Brenzel, 1991; DeRoeck and Levin, 1998). The recent study in Bangladesh estimated the cost per FIC to be less than \$12 and the cost per CFIC to be around \$9—around half of the estimates obtained for Morocco. The lower cost in Bangladesh is to be expected because of very low personnel costs there compared to Morocco and because the population size and density of Bangladesh, as compared with Morocco, creates economies of scale with regard to immunization programs (*Centre International de l'Enfance et de la Famille*, 1998; DeRoeck and Levin, 1998). However, the data quality and limitations of the two studies were quite different, so comparisons between the findings should be interpreted with caution.

3.2 Recurrent, Variable Non-Personnel Costs

The recurrent variable non-personnel costs of the immunization program for 1997/98, used as the baseline for the cost and financing projections for the program in the future (Section 6), are shown in Table 10 and in Figure 6. These include the cost of the routine program and the National Immunization Days, as explained at the beginning of this section.

These data show that vaccines make up nearly 80 percent of recurrent variable non-personnel costs of the program. Vaccine supplies, such as needles and syringes, make up less than 6 percent of these costs, and transportation costs to the MOH around 5 percent. Social mobilization costs account for another 3 percent (although the social mobilization costs of the NIDs are likely underestimated, as explained above). These data highlight the dominance of vaccines in the recurrent program costs for which the MOH must find financing each year.

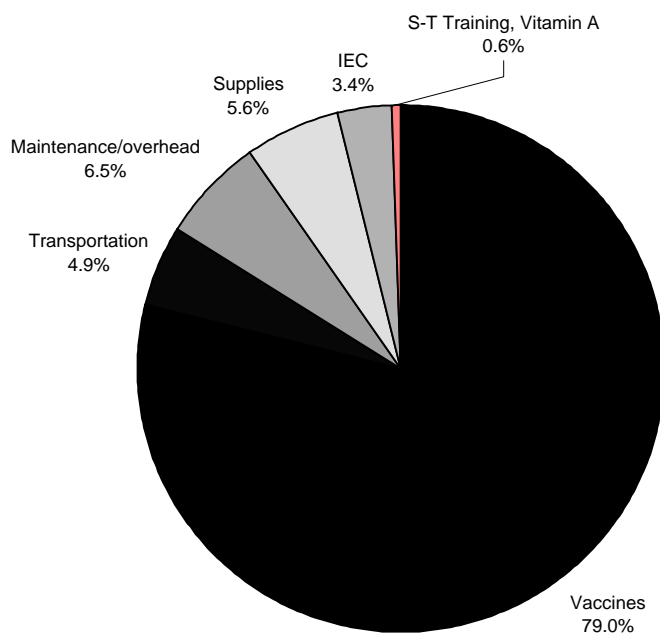
¹² While the weaknesses of using administrative reports for this type of evaluation are well recognized, an absence of survey data necessitated their use; as such, the results should be interpreted with caution.

Table 10. Estimated Recurrent, Variable Non-Personnel Costs of the Immunization Program, 1997/98

Cost Component	Cost (US\$)	Percentage of Total
Vaccines	\$2,217,684	79.0
Supplies	157,736	5.6
Vitamin A	14,736	0.5
Transportation*	137,770	4.9
Maintenance and overhead	181,172	6.5
IEC/Social Mobilization	95,293	3.4
Short-term Training	2,896	0.1
TOTAL	\$2,807,287	100.0

* Transportation costs include only the costs during the NIDs incurred by the health sector, and the cost of transportation for routine immunization activities.

Figure 6. Breakdown of Recurrent Variable Non-Personnel Costs by Component, 1997/98



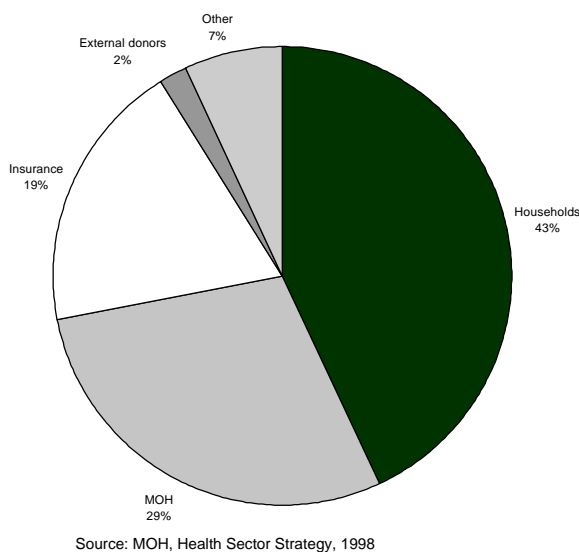
4. Immunization Financing in Morocco: Description and Assessment

4.1 Overall Health Financing in Morocco

The health sector in Morocco is considered underfunded, as compared to neighboring and/or comparable countries. Health expenditures from all sources (the government, households, etc.) amounted to about \$40 per person in 1997, the equivalent of 3.8 percent of GDP. This compares to around \$100 spent per person in Tunisia for the same year, which was around 5 percent of GDP. There are, as in most countries, large disparities in health spending by region and especially by urban/rural location. Overall, health financing in Morocco is characterized by limited and relatively inflexible government budgets, a result of a structural adjustment program and the heavy burden of the public debt, relatively modest growth in government health spending over time, a preponderance of spending on hospital care, and relatively low health insurance coverage.

Figure 7 shows the estimated contribution of various financing sources for overall health care spending in 1995.

Figure 7. Sources of Health Spending in Morocco (1995)



As shown in the figure, household out-of-pocket expenditures make up the single largest source of health financing (43 percent), followed by central government allocations to the Ministry of Health (29 percent), public and private insurance programs (19 percent), other sources (7 percent), and contributions from external donors (2 percent). The external contributions do not include the World Bank and African Development Bank (ADB) loans, which are considered part of the MOH budget allocations. Each of these sources will be discussed briefly below.

4.1.1 Government Budget Allocations

Approximately 92 percent of public sector financing for health comes from the Ministry of Health budget, the rest coming from other ministries such as armed forces, justice, education, etc. and government-owned companies. The MOH budget for 1997/98 totaled DH3,622,404,000 (around \$38 million), which is 4.9 percent of the total government budget (*budget général de l'état*), and the equivalent of less than 1 percent of the country's GDP. This compares to Tunisia's health budget, which makes up 8.5 percent of the national budget and around 2.5 percent of GDP (personal communication with MOH, 1999). The budget has increased markedly from 1990, when it was DH 1,923,514,791 (around \$25.6 million at the time). However, as a percentage of the entire government budget, the health budget has not increased much over the past three decades, and it has been volatile, making up 6.16 percent of the total government budget in 1970, 3.6 percent in 1980, and 4.5 percent in 1990 (MOH data).

The MOH budget consists of an investment budget, which makes up on average approximately 19 percent of the total budget, and an operating budget, which makes up the other 81 percent or so. Because these two budgets are financed quite differently, they are discussed separately below.

4.1.1.1 The MOH Investment Budget and the Development Bank Loan Programs

The investment budget, intended for expansion and improvement of the health system infrastructure, such as the construction or renovating of health centers and rural hospitals, is the mechanism used to channel all funds from development bank loans, including those of the World Bank. However, as discussed below, a significant portion of the "investment" budget actually pays for consumables, including drugs, vaccines, gasoline for transport, IEC materials, and other supplies, which are normally considered recurrent or operating expenditures. The inclusion of these recurrent expenses in the investment budget is a means for the government to protect these funds, ensure needed funding in hard currency, and be able to carry over remaining funds to the next year (which is not possible with the operating budget).

As shown in Table 11, approximately 62 percent of the 1997/98 investment budget is provided by the Moroccan government, 22 percent by the current World Bank loan, and 16 percent by an African Development Bank loan. Over the past four years, the government has covered on average 70 percent of the MOH investment budget, the World Bank loan programs have funded around 17 percent, and the ADB the remaining 12 percent. The table also shows that the investment budget has grown substantially since 1994, especially in 1997/98—the year the new World Bank loan program (BAJ1) began—when it increased 56 percent over the previous year (DH 320 million to DH500 million).¹³

Table 11. Ministry of Health Investment Budget by Financing Source, 1994-97/98. Disbursements in Millions of Moroccan Dirhams (% of total)

Financing Source	1994 Actual	1995 Actual	1996/97 Actual	1997/98 Budgeted	Four-Year Total	Percent Share (Avg.)
State Budget	232.9 (78%)	192.5 (75%)	232.6 (73%)	310.2 (62%)	968.2	70.5

¹³ It should be noted, however, that the 1997/98 figures represent the amount budgeted, whereas the figures for the previous years show actual expenditures.

World Bank	52.4 (18%)	16.6 (6.5%)	58.4 (18%)	108.1 (22%)	235.5	17.2
African Development Bank	10.9 (4%)	47.3 (18.5%)	29.2 (9%)	81.7 (16%)	169.1	12.3
Total Disbursements	296.2 (100%)	256.4 (100%)	320.2 (100%)	500.0 (100.0%)	1,372.8	100.0

Source: World Bank

The World Bank has been investing directly in Morocco's health system since 1986, through a series of three loan programs. The first, the Health Development Project, was a relatively small (\$28.8 million) project that focused on improving primary health care services in three pilot provinces from 1986 to 1993, as well as on improving the drug supply system. Nationwide support from the Bank for the health sector began with the Health Sector Investment Project, or PRISS (the French acronym), a \$104 million loan program that lasted from 1990 to the end of 1998. The aim of the PRISS was to establish sustainable health programs nationwide, strengthen the administration and management of services, and introduce some health financing reforms. PRISS funding has been used by the MOH to support its maternal and child health programs, including the National Immunization Program, the Tuberculosis Control Program, programs to combat ARI and diarrheal diseases and other communicable disease programs, as well as the national family planning program. Although placed under the MOH's investment budget, a substantial portion of PRISS funding was used for recurrent expenses associated with these programs, including all vaccine purchases made by the government, drugs, and other operating expenses, as well as capital items such as vehicles, medical equipment, and the renovation and construction of health centers, maternities, and hospitals.

The current World Bank health project being implemented, which began in fiscal 1997/98, is part of the Social Priorities Program I (or BAJI in Arabic), a multi-sectoral loan program aimed at improving education and health services for the poor, as well as creating job opportunities for the unemployed. The health project, financed for four years with \$68 million, has three objectives: (1) to improve access to essential curative and preventive health services in 13 of the country's poorest provinces; (2) to strengthen the Safe Motherhood Program by reducing maternal mortality in the 13 target provinces; and (3) to maintain support for priority health programs nationwide. The priority health program component includes support for the NIP—a major beneficiary of this project—as well as support for other programs to combat infectious diseases, including ARI, sexually transmitted diseases, and tuberculosis. Overall, the loan finances the construction and renovation of more than 280 rural health centers, dispensaries, and hospitals; equipment such as vehicles and motorcycles to support outreach and logistics services; medical equipment; training of health personnel and traditional birth attendants; IEC activities; and technical assistance to help reorganize services. Again, as with the PRISS, the loan program is used for such recurrent expenditures as drugs, all vaccines purchased through the VII, fuel and vehicle maintenance, and other supplies. The BAJI is expected to end in 2001.

The World Bank has proposed a follow-on loan program (BAJ2), but it is uncertain at this time if it will be implemented. However, the Bank and the Moroccan government are currently negotiating a new five-year Health Financing and Management Project, slated to begin in 1999, and overlapping with the current loan program by three years. The goal of this program is to enact major financing and management reforms in the health sector, including hospital reforms to increase their autonomy, improve financing, and improve the quality of services; and health insurance reforms aimed at doubling insurance coverage for formal sector employees and providing hospital insurance coverage for the poor. Since this new loan will shift the focus from funding basic health services to financing health sector reforms, the likelihood of this loan being used to pay for most of the non-personnel recurrent costs of the NIP program as well as other basic primary health care programs is very low. Sections 5 and 6, discuss the implications of the cessation of World Bank financing for the immunization program, possible options for replacing Bank funds to finance the NIP, and the potential impact of proposed health sector reforms on immunization financing.

Since 1993, the African Development Bank has implemented a DH 614 million loan program to improve access to basic health services in rural areas through the construction of rural health centers and by strengthening priority health programs. However, to date, only around half of the planned health facilities have been built and only 44 percent of the loan has been used, due to cumbersome bureaucratic procedures of both the ADB and the government, and to low absorption capacity, especially in the rural areas. The loan program, slated to end in 1999, does not have a role in financing of the NIP.

4.1.1.2 The MOH Operating Budget

The operating budget covers all recurrent expenditures not covered by the investment budget and Bank loans, including health personnel (the largest category); drugs, especially for hospital care; and other consumables and supplies. The operating budget is financed exclusively by the government of Morocco. In the past five years, it has accounted for between 77 percent and 83 percent of the entire MOH budget.

4.1.1.3 The Overall MOH Budget

Putting together the operating and investment budgets, the government contributed, on average, an estimated 96.7 percent of the total MOH budget between 1994 and 1997/98, the World Bank loans made up on average 2 percent of the budget, and the African Development Bank loan accounted for 1.4 percent.

4.1.1.4 Uses of MOH Funds

Table 12 shows the uses of MOH funds in 1997/98, broken down by the investment, operating, and personnel budgets. Overall, more than half of the entire MOH budget (56 percent) went towards hospital services, not including hospital personnel costs, whereas one-third was used for primary health care services. The table also shows the importance of the investment budget, including World Bank and ABD loan funds, in funding primary health care services. Whereas 55 percent of the investment budget went towards primary health care, only 7 percent of the MOH operating budget and 37 percent of the personnel budget was used for primary health care. This contrasts with 80 percent of the operating budget and 52 percent of the personnel budget being used for hospital care. In all 58 percent of the total MOH budget goes towards personnel costs.

Table 12. Breakdown (%) of MOH Budget by Use of Funds, 1997/98

Use of Funds	Investment Budget	Operating Budget	Personnel	Total MOH Budget
Hospital services	40.8	79.7	51.7	55.7
Primary health care	55.0	7.4	36.6	33.8
Administration and other	4.2	12.9	11.7	10.5
TOTAL	100.0	100.0	100.0	100.0
% of total MOH budget	21.0	21.0	58.0	100.0

Source: MOH Division of Planning and Financial Resources

The skewing of the MOH budget towards hospital care is matched by a disproportionate amount of MOH expenditures being used in urban areas, where many of the hospitals are located, and for the better-off segments of the population. Although about half of Morocco's population is located in rural areas, 73 percent of public health expenditures between 1990 and 1995 were spent in urban areas, and only 27 percent in rural areas, according to the *1997 Human Development Report* (UNDP, 1997). In addition, 45 percent of all MOH expenditures were used for the richest 20 percent of the population, whereas less than 20 percent of total expenditures went towards the poorest 40 percent (UNDP, 1997).

4.1.2 Health Insurance

Around 19 percent of total health expenditures are paid by various public and private health insurance programs, which in total cover around 15 percent of Morocco's population. The largest program by far is the *Caisse Nationale des Oeuvres de Prévoyance Sociale*, an umbrella organization of insurance companies, called "mutuelles" in Morocco, that provides coverage for medical and surgical services to approximately 80 percent of civil servants and their families, for a total of 2.9 million beneficiaries—around 10.5 percent of the population (MOH Division of Planning and Financial Resources). The CNOPS is financed by government allocations and a payroll deduction of 2.5 percent and pays for services either through direct reimbursement to patients (for a fixed percentage of medical expenditures) or direct payment to providers. The CNOPS operates one clinic and several laboratories, and some health insurance companies members have clinics and labs. However, overall, most of the funds provided by the CNOPS go to the private health service delivery sector. The actual rate of reimbursement for services is estimated by the MOH to be around 50 percent. The CNOPS is plagued with management problems, cost overruns, and inadequate or late payments from the government.

Approximately 15 percent of private sector employees (or 4 percent of the population) have health insurance coverage provided by their employers through health insurance companies (World Bank, 1998). These include *mutuelles d'entreprise* (employer-based insurance companies) and the *Caisse Mutualiste Interprofessionnelle Marocaine* (interprofessional mutual fund). These insurance plans pay mainly for curative care services, and many do not cover preventive care services, including immunizations. However, as will be discussed in Section 6, the role of insurance programs in financing immunization services in Morocco may potentially increase with the enactment of planned health sector reforms.

4.1.3 Household Health Expenditures and Cost Recovery

Out-of-pocket payments by households constitutes the largest single source of overall health financing in Morocco, responsible for an estimated 43 percent of total health expenditures. Most of these payments go towards drug purchases made at private pharmacies (since public health facilities do not provide most drugs), as well as to health services provided in the private sector and hospital services in the public sector. Cost recovery in the public sector is officially practiced only in hospitals, and all outpatient services provided at health centers and dispensaries, including immunization services, are officially provided free-of-charge. In the public hospital sector, two-thirds of the hospitals (*hôpitaux en régie*) depend entirely on government budget allocations, and only the remaining third (38 hospitals), designated as partial autonomous (SEGMA hospitals) practice cost recovery to any extent. In addition, according to the World Bank, the cost recovery performance of these hospitals is quite poor, as a result of obsolete fee schedules, which do not reflect costs; the lack of strong management procedures and tools; a poor record of reimbursement from the CNOPS; and other difficulties obtaining reimbursement from insurance programs. The MOH estimates that cost recovery covers less than 15 percent of the total cost of services provided in public hospitals (MOH, 1998).

4.1.4 International Donor Funding

International donors have been making important contributions to the health sector in Morocco—in the form of materials, medical supplies and equipment, technical assistance, and funding for the last two decades. Though the estimated total contribution of external donors—not including World Bank and ADB loans that are channeled through the MOH budget—currently makes up only around 2 percent of total global health funding, it has played a critical role in funding key maternal and child health programs, including the NIP program. Important donors in the health sector have included both multi-lateral agencies, such as UNICEF, UNDP, WHO, and the European Union, as well as bilateral aid agencies, most notably, USAID, the Luxembourg government, and French Cooperation. Assistance from these agencies has totaled more than \$82 million from 1992 to the present, mainly to support family planning and child health programs (World Bank, 1996). The role of donor funding in the NIP program is discussed in detail in Section 4.2 below.

4.2 Financing of Immunization Services in Morocco

This section discusses the trends of immunization financing and the current financing situation in Morocco. For the current financing picture, it analyzes the contributions of the major funding sources for the program as a whole as well as separately for routine immunization services and the National Immunization Days, since the financing patterns of these two parts of the immunization program are quite distinct.

For all three sets of analyses (routine program, NIDs, and the total program), it provides estimates of the contribution of sources of financing both in terms of the *total estimated costs* of services and in terms of *NIP program-specific costs*. As explained more fully in Section 2.2.3, total estimated costs include all costs that go into providing immunization services, including fixed costs such as building space and health personnel that are shared with other health programs. Program-specific costs, on the other hand, include only the costs used to provide immunization services over and above the costs shared by other health activities. In addition to recurrent variable costs such as vaccines and supplies, program-specific costs include personnel and transportation contributions to the NIDs that are provided by other sectors, since these costs would represent additional costs to the

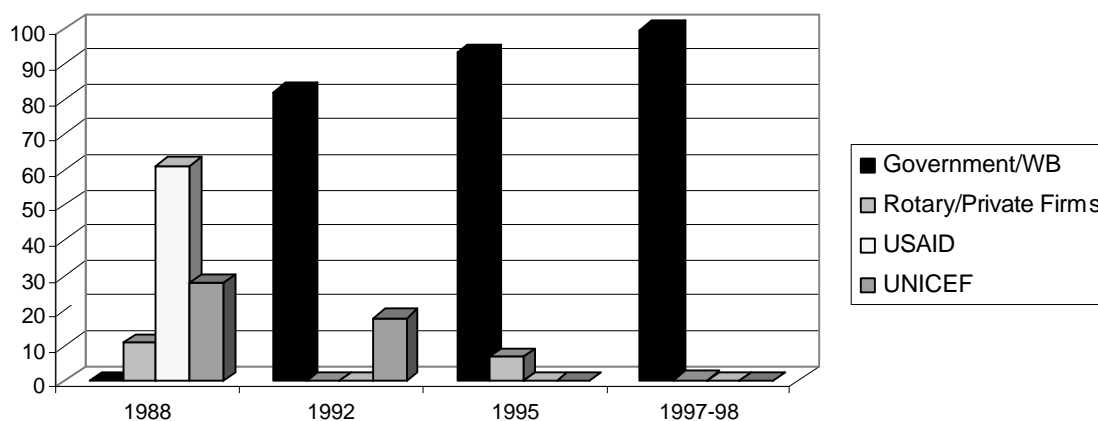
health sector, if it had to organize the NIDs without the support of other sectors. NIP program-specific costs also include the cost of cold chain and other immunization-related equipment (e.g., sterilizers).

4.2.1 Trends in Immunization Financing

4.2.1.1 Changes in Mix of Financing Sources

In terms of the financing of immunization services in Morocco, two phases can be distinguished. The first phase took place from around 1970 to the end of the 1980s. The 1970s were the era of mass campaigns and the 1980s began with the implementation of the EPI and ended with the start of the NIP. During this first phase, much of the financing of direct program inputs, such as vaccines, vaccine supplies, and cold chain equipment was provided by international donors, notably UNICEF, USAID, and WHO. During the second period, beginning in the early 1990s, direct donor support for the program declined and was replaced by World Bank loan funding channeled through the MOH investment budget. Although some contributions of vaccines continued to be made during this time, especially donations from Rotary International for polio vaccine, the government using the World Bank loan funds now purchases nearly all vaccines. The vaccines are purchased through the Vaccine Independence Initiative, using a revolving fund initially capitalized by USAID. Thus, the role of donors such as UNICEF and USAID has evolved from direct contributors for vaccines and other immunization-related inputs to one of facilitating the government's purchase and financing of its vaccine supply. The evolution in the financing of vaccines in the last decade is shown in Figure 8.

Figure 8. Trends in Vaccine Financing in Morocco, 1988–1998



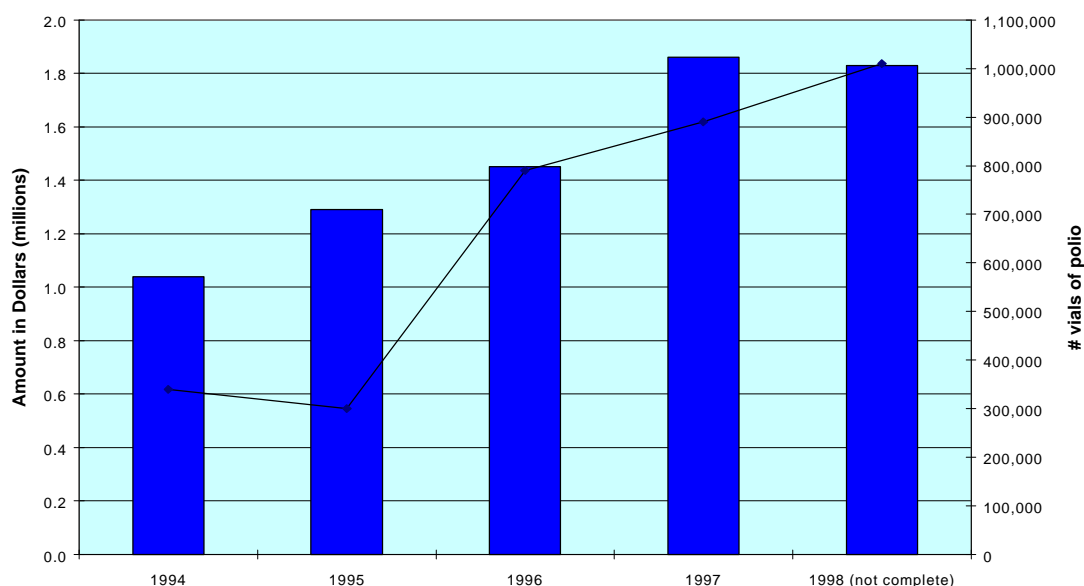
A third phase will likely begin with the development of a new five-year health plan for 1999–2003, which will include many planned improvements to the NIP. Also during this phase the BAJ1 World Bank loan will come to an end. The planned changes to the program, including the introduction of Hepatitis B in the vaccination schedule, efforts to increase immunization coverage in the relatively poor-performing areas, replacement of cold chain equipment, and the use of single-use syringes, will all greatly increase the cost of the current program. These increased costs, coming at a time when donor funding for immunizations continues to decline and World Bank financing is uncertain, presents a great challenge to Morocco to increase efficiency in the program and ensure sustainable financing. One question is whether the government is willing to mobilize additional local resources to finance the NIP. One way to do this could be to broaden the proposed financing reforms

to include immunization services and other preventive health care. As of now, the proposed reforms, which include expanding health insurance coverage, focus mainly on hospital and curative care. Discussion on ways to improve the sustainability of the future financing of the NIP is presented in Section 6.

4.2.1.2 Funding Amounts Spent on the NIP

Only for the last few years—since the BAJ1 loan began—has the MOH prepared a specific NIP budget separate from the overall Maternal and Child Health Program budget. Further, the NIP budget includes only part of the expenses of the program—mainly vaccines, transportation costs, and some staff travel and per diem costs. Other expenditures, such as vaccine-related supplies, IEC costs, and so forth, still come out of the overall MCH budget. For these reasons, it is difficult to accurately track funding for the NIP over time. However, data on vaccine expenditures from 1994 to 1998, which account for 80 percent of recurrent variable non-personnel costs, show a marked increase in vaccine purchases—from a little more than \$1 million in 1994 to nearly \$2 million in 1998 (see Figure 9). Much of the additional purchases went towards buying OPV for the polio eradication program that began in 1995.

Figure 9. Trends in Vaccine Purchases through the VII in Morocco, 1994-98



4.2.2 Current Financing of Immunization Services

4.2.2.1 Sources of Immunization Financing

All of the funding sources involved in financing the health sector as a whole (discussed above) play a role in financing immunization services in Morocco. However, the relative importance of these funding sources for immunization services vs. health care overall differs considerably, as discussed below.

▲ Government resources

The government contributes to the NIP program both through the investment budget and through the operating budget. The investment budget contains many of the immunization-specific recurrent costs, such as vaccines and vaccine supplies, which are financed largely by the World Bank loan (see below). The operating budget, in addition to paying for general operating costs of the health system such as health personnel, building construction and maintenance, and other recurrent costs, has around DH8 million per year (around \$842,000) set aside specifically for the NIP to cover the costs of vaccination cards, clinic records, gasoline for supervisions, and so forth. In addition to central government funds provided through the MOH budget, local and regional governments contribute to the program by providing personnel, transportation, and IEC support during the National Immunization Days.

▲ World Bank loan funds

Funds from the World Bank loan program are protected funds used to pay for many of the NIP's immunization-specific recurrent costs through the government investment budget. All vaccines bought through the VII are paid for with these funds, as are all vaccine-related supplies (e.g., syringes), and transport costs, such as gasoline for use of MOH vehicles for NIP use and for the distribution of vaccines throughout the country.

▲ Donor funding

Donors, including both bilateral aid agencies, such as USAID and French Cooperation, and multi-lateral agencies, such as UNICEF and WHO, have provided critical support to the NIP program over the years, mainly for specific NIP-related items and activities, such as cold chain equipment (notably UNICEF and USAID), vehicle purchases, social mobilization activities and materials (especially USAID), and training. WHO played an important role in financing improvements to the national laboratory and in training local health personnel to improve the country's disease surveillance capacity, especially for acute flaccid paralysis under the polio eradication program. Private donors have also contributed to the program: Rotary has made several contributions of polio vaccine in conjunction with the polio eradication campaign, and private pharmaceutical companies have donated free vaccines on an irregular basis. These include Merck, Sharp, and Dohme, which provided quantities of Hepatitis B in 1996 used to vaccinate health personnel and donated some Hib vaccine in 1997 used to immunize children under five in Casablanca. Further details on donor funding of the NIP program are found in Section 4.2.2.5 below.

▲ Insurance

Fifteen percent of the Moroccan population is covered by health insurance, which contributes an estimated 19 percent of overall health financing in Morocco. However, the great majority of the expenditures made by insurance programs are for curative care services. Most private employer-based insurance does not cover preventive care, and the CNOPS reimburses only a portion (around 50 percent) of medical costs paid by the beneficiary, including vaccinations. Consequently, most people, even those insured, go to public health facilities to have their children immunized. Therefore, the part that insurance programs contribute to immunization financing in Morocco is considered to be negligible—probably less than one-half of 1 percent.

▲ Household contributions

The contribution of out-of-pocket payments for immunization services is also negligible in Morocco. According to the NIP, only an estimated 2 to 4 percent of all immunizations administered are delivered through the private sector, where patients are charged for the visit and the cost of the vaccines. In addition, a portion of these immunizations may be reimbursed by insurance.

- ▲ Fees for the complete series of EPI vaccines charged by private providers today in Morocco are typically around DH255.20 (\$27), according to private sector sources.¹⁴ If one adds the charges for medical visits to a general practitioner, the total will be around 455 DH (\$48). This compares to the estimated public sector cost of around \$20 per fully immunized child obtained in this study (Section 3.1.4).

In the public sector, parents in several urban areas are encouraged to buy disposable syringes before coming to health facilities to have their children immunized, reportedly because of the questionable reliability of aging sterilization equipment in public health facilities. One clinic in Rabat, for instance, estimated that 90 percent of mothers coming to have their children vaccinated bring disposable syringes with them. Another form of cost sharing in the public sector reported in some urban areas, including the Tamara area near Rabat, is having patients pay for vaccination cards. The combined contributions of out-of-pocket payments to the public and private sectors for immunization services are, in any event, quite small, most likely accounting for less than 2 percent of the total financing for immunization services.

The following sections break down the estimated financing of immunization services by funding source. Since it was not possible to measure the contribution of households and insurance programs, and since these sources are likely to account for less than 2.5 percent of total funding for immunizations combined, the study estimates the relative contribution of the three main funding sources only—government allocations (both central MOH and local government contributions), World Bank loan funds, and donor contributions.

4.2.2.2 Financing of Routine NIP Services

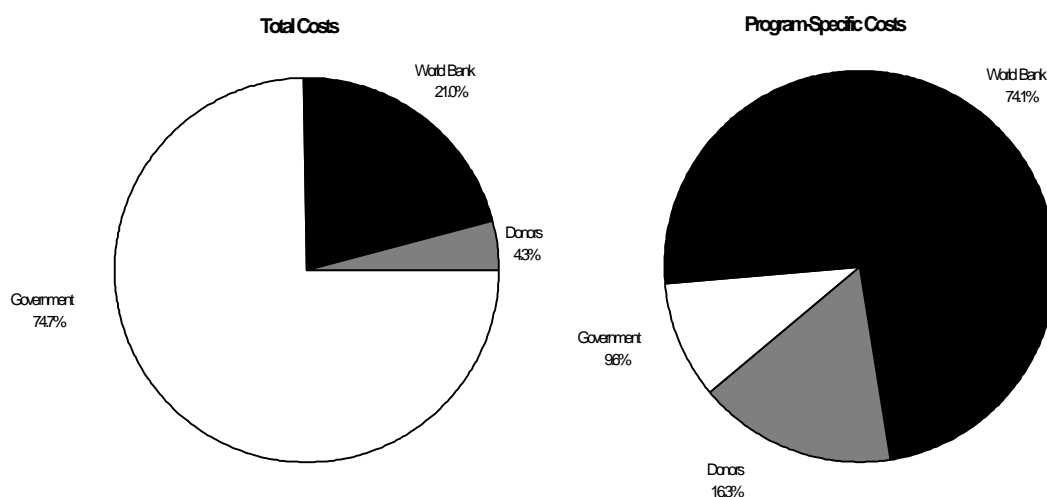
Figure 10 and Table 13 show the breakdown of the estimated cost of routine immunization services provided by the MOH—both the total estimated costs and program-specific costs—by funding source for 1997/98. These data clearly show that, in terms of the *total costs* of delivering routine immunization services, the major funder is the Moroccan government, which contributes 75 percent of estimated total costs, for a total of \$5.7 million. Most of the government's contribution for routine immunization activities goes towards health personnel, which accounts for 62 percent of total costs, and other fixed costs shared by other health activities, such as building space and vehicles. The World Bank loan covers an estimated 21 percent of total routine program costs—for a total of \$1.6 million—and the majority of hard currency purchases, which include vaccines, cold chain equipment,

¹⁴ Estimated costs of the vaccine series to the patients are:

BCG (1 dose):	DH 47.10
DPT (3 doses):	DH 63.40
OPV (4 doses):	DH 83.60
Measles (1 dose):	DH 61.60
TOTAL	DH 255.20

supplies, and training. Vaccines constitutes by far the largest item paid with the World Bank loan funds, costing an estimated \$1,287,000 in 1997/98 for routine services alone. Bank funds were also used to pay for supplies and transportation costs, and to finance the construction of several new health facilities. Donor contributions provided around 4 percent of estimated total funding for routine immunization services (around \$332,000), mainly for cold chain equipment and social mobilization.

Figure 10. Financing of the Routine Immunization Program, by Funding Source, 1997/98



Looking only at NIP *program-specific costs*, the importance of the World Bank loan in financing the program increases dramatically. Bank funds account for 74 percent of program-specific costs, mainly due to the fact that the loan funds vaccines, which account for 68 percent of these costs, as well as other recurrent costs such as supplies and transportation. The program-specific costs picked up by the government are only for maintenance and overhead costs, accounting for less than 10 percent of total funding. Donor contributions account for 16 percent of program-specific costs, mainly going towards cold chain equipment and social mobilization activities and materials. Expenses paid in hard currency—vaccines, supplies, cold chain equipment, etc.—represent almost 88 percent of all program-specific costs and are financed entirely by the World Bank loan and donors.

Table 13. Financing of Routine Immunization Activities by Funding Source, 1997/98

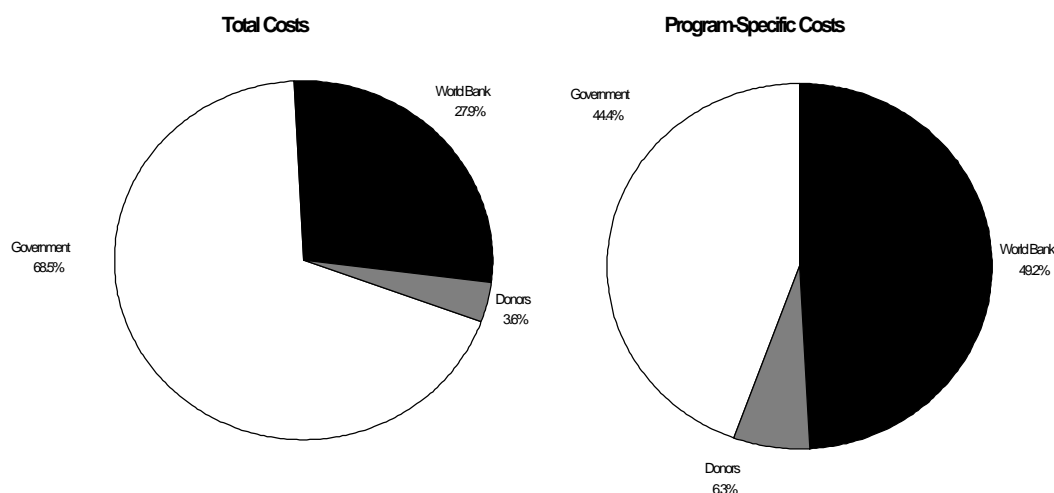
Cost Component	Total Costs (US\$000)				% of Total Costs	Program-Specific Costs (US\$000)				% of Total Costs
	Government	World Bank	Donors	Total		Government	World Bank	Donors	Total	
Capital Costs										
Buildings	749	187	0	936	12.2	—	—	—	—	—
Vehicles	29	14	14	57.5	0.8	—	—	—	—	—
Equipment (incl. cold chain)	0	0	289	289	3.8	0	0	289	289	15.3
Education/Long-term training	0	0	8.5	8.5	0.1	—	—	—	—	—
Sub-Total	777	201	312	1,291	16.9	0	0	289	289	15.3
Recurrent Costs										
Personnel	4,750.5	0	0	4,750.5	62.0	—	—	—	—	—
Vaccines	0	1,287	0	1,287	16.8	0	1,287	0	1,287	67.9
Supplies	0	92	0	92	1.2	0	92	0	92	4.8
Transportation	0	26	0	26	0.4	0	26	0	26	1.4
Short-term training	0	0	3	3	0.04	0	0	3	3	0.15
IEC/Social mobilization	0	0	17	17	0.2	0	0	17	17	0.9
Maintenance/Overhead	181	0	0	181	2.4	181	0	0	181	9.6
Sub-Total	4,932	1,405	20	6,357	83.1	181	1,405	20	1,607	84.7
TOTAL COSTS	5,709	1,607	332	7,648	100.0	181	1,405	309	1,896	100.0
PERCENT OF TOTAL	74.6%	21.0%	4.3%	100.0%		9.6%	74.1%	16.3%	100.0%	

4.2.2.3 Financing of the National Immunization Days

The financing picture for the NIDs, which represent 32 percent of NIP total costs, is shown in Figure 11 and Table 14. Table 15 shows the breakdown of the government's share of NIDs financing by the MOH and other government sectors.

Financing of the *total estimated costs* of the NIDs is similar to that of the total costs of the routine program: The government (MOH and other government sectors) fund the majority of costs (69 percent), in the form of personnel and transportation costs. The World Bank loan finances the recurrent items of vaccines and supplies, which are 28 percent of the total estimated cost of the NIDs or around \$996,000. Donors, although funding less than 4 percent of the total NIDs costs, make an important contribution by financing critical social mobilization activities, transportation costs, and the Vitamin A supplements that were first distributed during the 1998 NIDs.¹⁵ It must be remembered, however, that the cost analysis underestimates the true contribution of other (non-health) sectors of the government in providing personnel for the NIDs and in participating in the social mobilization activities that are critical in the success of these campaigns. Therefore, the government's overall share of NIDs financing is greater than these figures indicate.

Figure 11. Financing of the National Immunization Days, by Funding Source, 1997/98



The government's share of the *program-specific costs* of the NIDs is substantially greater than for the routine program (44 percent vs. less than 10 percent). This is due to the fact that the government pays for the time spent for the NIDs by government employees in other sectors, such as school teachers and army personnel, which this study considers a program-specific cost that is additional to the health sector, as opposed to the time health personnel spend on the NIDs. The government—mainly local-level authorities—also funds most transportation costs, which are substantially greater than for routine immunization activities, given the extensive outreach that is an essential part of the NIDs. Most of these transportation costs are also borne by sectors of the government other than health. In fact, as shown in Table 15, most of the program-specific costs funded by the government—over \$823,000, which represents 92 percent of the government's total funding for program-specific costs and 41 percent of all program-specific funding—come from sectors other than health.

¹⁵ Donor contributions are somewhat underestimated, since direct contributions by donors to the local (sub-national) level were not included in this analysis, due to a lack of data.

Table 14. Financing of the National Immunization Days, by Funding Source, 1997/98

	Total Costs (US\$000)					Program-Specific Costs (US\$000)				
Cost Component	Govern- ment	World Bank	Donors	Total	% of Total Costs	Govern- ment	World Bank	Donors	Total	% of Total Costs
Personnel*	1,968	0	0	1,968	55.2	426	0	0	426	21.1
Vaccines	0	930	0	930	26.1	0	930	0	930	46.0
Supplies	0	66	0	66	1.8	0	66	0	66	3.3
Vitamin A	0	0	15	15	0.4	0	0	15	15	0.7
Transportation	473	0	35	508	14.3	473	0	35	508	25.1
IEC/Social mobilization	0	0	78	78	2.2	0	0	78	78	3.8
TOTAL COSTS	2,441	996	128	3,565	100.0	899	996	128	2,023	100.0
PERCENT OF TOTAL	68.5%	27.9%	3.6%	100.0%		44.4%	49.2%	6.3%	99.9	

Note: Due to rounding, not all figures will add up to 100%.

* Program-specific personnel costs include only the estimated costs of non-health personnel.

Table 15. Breakdown of the Moroccan Government's Share of Financing of the National Immunization Days, by Health and Other Sectors, 1997/98

Cost Component	Contribution towards Total Costs (US\$000)			Contribution towards Program-Specific Costs (US\$000)		
	Ministry of Health	Other Sectors	Total	Ministry of Health	Other Sectors	Total
Personnel	\$1,541.5	\$426	\$1,968	\$0	\$426	\$426
Vaccines	0	0	0	0	0	0
Supplies	0	0	0	0	0	0
Vitamin A	0	0	0	0	0	0
Transportation	76	397	473	76	397	473
IEC/Social mobilization	0	0*	0	0	0*	0
TOTAL GOV'T CONTRIBUTION	\$1,618	\$823	\$2,441	\$76	\$823	\$899
PERCENTAGE OF TOTAL GOV'T CONTRIBUTION	66.3%	33.7%	100.0%	8.5%	91.5%	100.0%
PERCENTAGE OF TOTAL NIDS COSTS	45.4%	23.1%	68.5%	3.8%	40.7%	44.4%

Non-health sectors also contribute towards social mobilization efforts in the connection with the NIDs but this contribution could not be estimated. The estimate of non-health personnel is also likely to be underestimated. Thus, the true contribution of non-health government sectors and of the government overall in financing the NIDs is underestimated.

The World Bank loan and donors fund the remaining 56 percent of the program-specific costs of the NIDs, in the form of vaccines, supplies, social mobilization, and some transportation costs. This analysis therefore shows that the government finances a larger share of the program-specific costs of the NIDs than it does for routine immunization activities and that most of these costs come from other (non-health) sectors of the government.

4.2.2.4 Financing of the Total National Immunization Program

Putting together the costs of the routine program and the NIDs, the financing of the entire NIP in 1997/98 is shown in Figure 12 and Table 16. The government paid an estimated \$8.1 million or around 73 percent of the *total estimated costs* of the entire program. This compares to an estimated 97 percent of the entire MOH budget paid by government allocations as discussed in Section 4.1.1.3. However, the government paid only a little more than one-quarter (27.6 percent) (around \$1.1 million) of the *program-specific costs*. The bulk of the total resources designated specifically for immunization activities (72 percent) continue to be financed by external resources, in the form of the World Bank loan (61 percent) and donor contributions (11 percent), including three main components of the NIP: vaccines, cold chain equipment, and supplies. External resources also account for 68 percent of the program-specific costs requiring purchases in hard currency. The routine immunization program is particularly dependent on external resources; the World Bank loan plus donor contributions finance an estimated 90 percent of all program-specific costs of routine immunization activities (vs. 56 percent of program-specific NIDs costs). All of these facts highlight the strong dependence of the NIP program on external funding and its vulnerability to any changes in the financing of the program. A further discussion of the sustainability of the current financing of the program follows in Section 4.2.3.

Figure 12. Financing of the Total National Immunization Program, by Funding Source, 1997/98

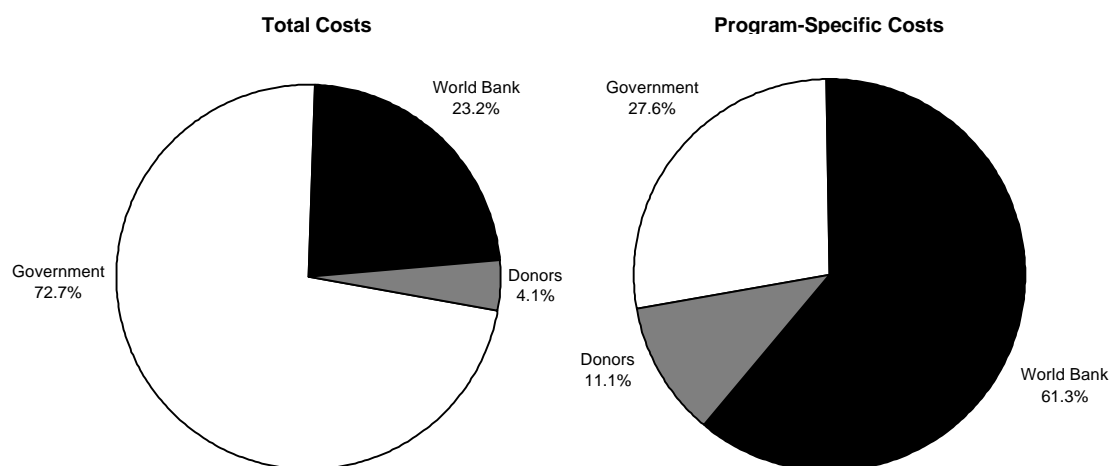


Table 16. Financing of National Immunization Program, by Funding Source, 1997/98

Cost Component	Total Costs (US\$000)				% of Total Costs	Program-Specific Costs (US\$000)				% of Total Costs
	Govern- ment	World Bank	Donors	Total		Govern- ment	World Bank	Donors	Total	
Capital Costs										
Buildings	\$749	\$187	\$0	\$936	8.3	—	—	—	—	—
Vehicles	29	14	14	57.5	0.5	—	—	—	—	—
Equipment (incl. cold chain)	0	0	289	289	2.6	0	0	289	289	7.4
Education/training	0	0	8.5	8.5	0.1	—	—	—	—	—
Sub-Total	777	201	312	1,291	11.5	0	0	289	289	7.4
Recurrent Costs										
Personnel	6,718	0	0	6,718	59.9	426	0	0	426	10.9
Vaccines	0	2,218	0	2,218	19.8	0	2,218	0	2,218	56.6
Supplies	0	158	0	158	1.4	0	158	0	158	4.0
Vitamin A	0	0	15	15	0.1	0	0	15	15	0.4
Transportation	473	26	35	534	4.8	473	26	35	534	13.6
Short-term training	0	0	3	3	0.03	0	0	3	3	0.07
IEC/Social Mob.	0	0	95	95	0.85	0	0	95	95	2.4
Maintenance / Overhead	181	0	0	181	1.6	181	0	0	181	4.6
Sub-Total	7,372	2,402	148	9,922	88.5	1,080	2,402	148	3,630	92.6
TOTAL COSTS	\$8,149	\$2,603	\$460	\$11,213	100.0	\$1,080	\$2,402	\$437	\$3,919	100.0
PERCENT OF TOTAL	72.7%	23.2%	4.1%	100.0%		27.6%	61.3%	11.1%	100.0%	

* EPI-specific personnel costs include only the estimated costs of non-health personnel.

Note: Due to rounding, not all figures will add up to 100%.

A breakdown of total donor funding by donor agency for 1997/98 is shown in Table 17. Although donor funding for the immunization program has decreased substantially in the past several years, donors still contributed an estimated 11 percent of program-specific costs, 24 percent of annual total capital costs, and 100 percent of the funding for equipment, social mobilization, Vitamin A, and training in 1997/98. UNICEF is an important contributor to the program. In addition to serving as intermediary for the procurement of low-cost, high-quality vaccines through the VII, it provided an estimated 50 percent of all donor funding for immunizations last year—around \$234,000—mainly in the form of cold chain equipment under its rural health program, which targets seven provinces. USAID provided a third of donor funding for the NIP in 1997/98, mainly for social mobilization activities for the NIDS and equipment. Rotary International also provides support to the NIDs for transportation and social mobilization costs, as well as periodic contributions of OPV: for example, it donated 6.8 million doses of OPV in 1993 (valued at more than \$600,000).

Table 17. Breakdown of Donor Funding for the National Immunization Program, by Donor, 1997/98 (US\$)

Cost Component	UNICEF	USAID	ROTARY	European Union	Others*	Total Donations	Donor Funds as % of Total Program Costs (per Item)
Capital Costs							
Buildings	—	—	—	—	—	0	0.0%
Vehicles	—	2,156	—	10,781	1,438	14,375	25.0%
Equipment (incl. cold chain)	216,985	57,863	—	—	14,466	289,313	100.0%
Education/Training	—	—	—	8,510	—	8,510	100.0%
Sub-Total	216,985	60,019	0	19,291	15,904	312,198	24.2%
Recurrent Costs							
Personnel	—	—	—	—	—	0	0.0%
Vaccines	—	—	—	—	—	0	0.0%
Supplies	—	—	—	—	—	0	0.0%
Vitamin A	11,052	—	—	—	3,684	14,736	100.0%
Transportation	5,250	12,250	10,500	—	7,000	35,000	6.5%
Short-term training	579	1,882	—	—	434	2,896	100.0%
IEC/Social mob.	—	76,234	9,529	—	9,529	95,293	100.0%
Maintenance / Overhead	—	—	—	—	—	0	0.0%
Sub-Total	16,881	90,366	20,029	0	20,647	147,925	1.5%
TOTAL	\$233,866	\$150,386	\$20,029	\$19,291	\$36,551	\$460,123	4.1%
% OF TOTAL DONOR FUNDING	50.8%	32.7%	4.4%	4.2%	7.9%	100.0%	

* Includes French Cooperation, UNPD, private firms, the Luxembourg government, Helen Keller International (for Vitamin A), and other NGOs.

4.2.3 Share of MOH and Government Spending for the NIP

As seen in Section 3.1.3, the total estimated cost of the NIP in 1997/98 was a little more than \$11 million. To determine what the NIP costs the MOH as a percentage of its total budget, it is necessary to subtract the NIDs-related costs paid by other government sectors, as well as the costs paid by donors (for IEC, Vitamin A, some transport, etc.). This amount is as follows:

Total estimated cost		\$11,213,203
NIDS-related costs paid by other sectors ¹⁶	-	822,946
Donor contributions ¹⁷	-	460,123
		<hr/>
Cost to MOH:		\$ 9,930,134 (DH 94,336,273) ¹⁸

This amount represents around 2.6 percent of the total MOH budget in 1997/98 of around DH 3.6 billion. In terms of recurrent variable non-personnel expenses for the NIP, that is, vaccines, supplies, transportation, and maintenance/overhead for which the MOH pays, the total of \$2,694,362 (DH 25,594,439) represents 3.6 percent of the MOH investment budget in 1997/98.

4.2.4 Analysis of Financing Strategies: Adequacy of Funding, Sustainability, Program Performance, Access, and Equity

The overall financing of Morocco's National Immunization Program, currently estimated at around \$11 million per year, has allowed the government to develop a well-performing program achieving overall coverage rates of around 89 percent, and much higher in many areas. The NIP has a reputation in the country and worldwide as being one of the strongest health programs in Morocco and one that has made significant progress in the last 10 years.

The Moroccan government has made it a policy to provide preventive health services, including immunizations to the entire population free-of-charge. Therefore, whereas an estimated 43 percent of total health care spending in Morocco comes directly from people's pockets, only a negligible amount of spending on immunization services is paid directly out-of-pocket. Direct payments are mainly made for vaccinations given by private providers, including newer vaccines such as Hepatitis B and Hib that are not yet available in the public sector. Another possible internal resource for immunization services—social insurance—has also been largely untapped, since only around 15 percent of the population has any type of health insurance coverage and most plans do not cover preventive health services. This leaves public funding to finance the great majority of immunization service costs.

4.2.4.1 Adequacy of Funding and Sustainability

The above analysis clearly shows the dependence of the NIP on external resources—including the World Bank loan and donor contributions—which together account for 72 percent of the financing for *program-specific costs*, that is, all costs except personnel and other “fixed” health sector

¹⁶ See Table 15.

¹⁷ See Table 17.

¹⁸ At an exchange rate of \$US = DH 9.5.

costs. Routine immunization activities are particularly dependent on outside funding sources, which pay for 90 percent of estimated program-specific costs. The National Immunization Days, on the other hand, are less dependent on outside funding, with the government picking up an estimated 44 percent of program-specific costs. However, the majority of these government resources come from sectors other than health. As mentioned above, the most important inputs to an immunization program, such as vaccines, cold chain equipment, and vaccine supplies, are all financed with external resources, either the Bank loan or donors.

To allow sufficient funding for the program, the government and the World Bank have negotiated a loan program that enables the government to tap into resources normally used for “investment” purposes—that is, for making long-term improvements to the overall health system. This strategy of using investment funds to pay for the bulk of recurrent costs for the NIP’s, as well as for other priority preventive health programs, has been a means of ensuring stable and adequate funding for the NIP for the last nine years or so. It also means, that the government can continue to use the majority of its budget allocations for health to finance hospital care, and still have a strong immunization program.

At the same time, however, true investments needed to develop a sustainable and well-functioning program over the long term, such as funds to improve the cold chain infrastructure, training and other investments to build capacity in planning and management, disease surveillance, supervision, etc., are not being made by the government and depend instead on donors. This shows an inherent weakness in this financing strategy: Nearly all financing, including World Bank loan funds, goes towards recurrent costs, with little left to pay for critical investments in terms of infrastructure and human resources.

There is therefore a need for the government to adopt a longer-term perspective in the financing of the NIP. This is especially true if the BAJ2 loan does not materialize in two years, because the current loan project was not designed with a long-term perspective—no progressive withdrawal of loan funding for the NIP and parallel increases in government contributions were built into the project.

World Bank loan funds are sometimes considered as a local resource, since they increase the resources mobilized by the government to carry out its economic and social programs. However, they constitute an external resource, which has a limited duration and which is added to an already large foreign debt burden, that in Morocco currently equals around 30 percent of the entire government budget.

To build a sustainable national immunization program—in terms of both financing and technical capacity—the government of Morocco will need to develop a financing strategy that is based largely on local (country) resources, with external funding decreasing over time and used primarily to strengthen critical support systems and to build capacity, both in terms of human resources and infrastructure. Possible options for developing such a strategy are presented in Section 6.3.

4.2.4.2 Program Performance

In terms of performance of the NIP, funding of the program through the World Bank loan has allowed the government to make substantial improvements in immunization coverage in the last decade. The availability of Bank loan funds and their relative flexibility also made it possible for the government to rapidly increase its vaccine budget in 1996 to buy large quantities of polio vaccine for the polio eradication campaign, which has continued since then. Thus, the strategy of using World Bank loan funds for basic program costs has been positive in terms of program performance over the

short term. However, since the loan funding may soon end, the challenge facing the government of Morocco in the next few years will be how to find sufficient funds to replace the loan funding that will allow it to maintain or even increase its coverage gains over the long term.

4.2.4.3 Access, Equity, and Quality Issues

The Moroccan government's policy of providing free immunizations in the public sector is intended as a principal means of promoting equity of access to these services to people from all areas of the country and at all socio-economic levels. In the name of equity, the central government does not officially allow or promote any types of cost recovery for immunization services in government health facilities, not even encouraging patients to bring their own disposable syringes or charging a small fee for vaccination cards. However, both of these practices, especially having patients buy their own syringes, take place in some of the major urban areas.

Despite government intentions, limited overall funding for health and the disparity in health resources between regional areas create inequities in terms of access to and quality of services provided. The greatest inequities involve access to routine immunization services between urban and isolated rural areas. Because of a shortage of fixed health facilities in rural areas—where 31 percent of the population must travel more than 10 kilometers to a health facility and 14 percent are not covered at all by the health system—access to immunization services on a routine basis is considerably less in most rural areas than in urban areas. This has resulted in significantly lower immunization coverage rates in a number of rural provinces than in urban areas. The NIP uses the National Immunization Days in part to increase coverage in the rural areas and therefore to help make up for the regional inequities in routine service delivery. However, since the NIDs take place only in the months of October and November each year, this policy can not compensate for the lack of access to immunization services in the underserved areas during the remaining 10 months of the year. Thus, even children immunized during the NIDs in rural areas are less likely to receive their vaccinations on schedule and to be fully immunized by the age of one. There is also anecdotal evidence that health workers in some rural areas tend to de-emphasize routine immunization services because they consider the NIDs the time to focus on providing immunizations.

A form of inequity also occurs in the area of injection safety. Because of the lack of confidence in aging sterilization equipment, health workers in urban areas strongly encourage patients to buy disposable syringes before coming to health facilities; some health centers in Rabat estimate that 90 percent of their patients bring their own syringes. This form of cost sharing is much less common in rural areas or in poorer urban areas, where private pharmacies are less accessible and where people are less able to afford to pay their own syringes. Thus the risks of unsafe injections are likely to be greater in the rural and poorer urban areas than in better-off urban areas.

4.3 Assessment of the Vaccine Independence Initiative in Morocco

4.3.1 Description and Evolution of the VII

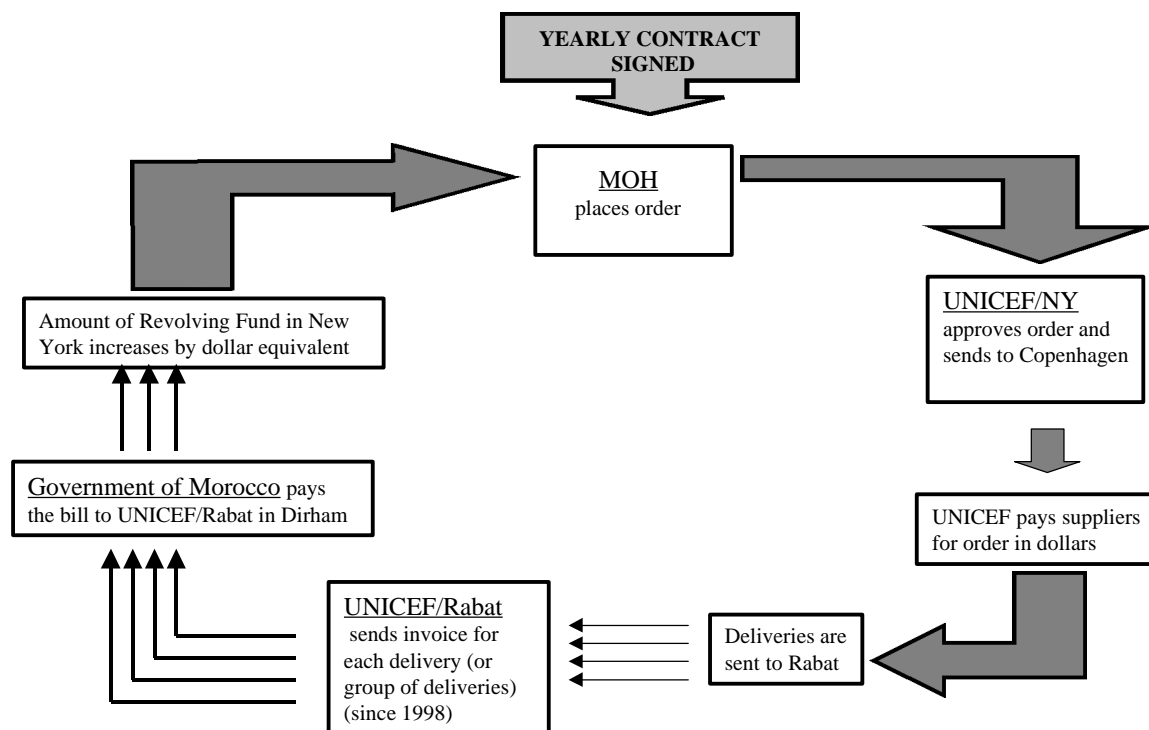
In 1993, Morocco became the first country to join the Vaccine Independence Initiative, an effort by UNICEF to assist countries in becoming self-sufficient in financing their vaccine supply. The VII allows countries to pay for vaccines in local currency and only once the commodities are delivered, thereby eliminating two major obstacles—the lack of hard currency and the need to pay in advance—that developing nations often face in purchasing vaccines on the open market. Participating countries

use UNICEF's procurement system, which provide high-quality vaccines at relatively low cost. For each participating country, a separate revolving fund is established at UNICEF headquarters in New York, which is used as a line of credit to cover the lag time between the purchase of vaccines by UNICEF and payment by the country in local currency. The program encourages each country to establish a separate budgetary line item for vaccines to help ensure that vaccine funds will not be diverted to other uses. It also requires countries to produce annual plans, with technical assistance, to determine their vaccine needs for the year. This gets countries to systematically plan their vaccine needs well ahead of time on an annual basis, thus helping to prevent disruptions in supply.

The revolving fund requires initial capitalization, which in the case of Morocco was provided by USAID (Rabat and Washington jointly) in the amount of \$600,000 and was later increased to \$1.1 million. The capitalization amount sets the limit for the amount of outstanding payments that a country can have at any one time. The government of Morocco actually purchases the vaccines (i.e., reimburses the revolving fund) with funds provided by the World Bank loan.

The basic functioning of the revolving fund in Morocco is depicted in Figure 13. The process begins each year with the development and signing of a contract between the GOM and UNICEF, which stipulates the amount of vaccines to be provided by UNICEF, the unit price of each vaccine, and the total value of the vaccines to be purchased. Since 1997/98, the contract amount and vaccine prices are stated in both dollars and dirham, with a fixed exchange rate for the year, to avoid currency exchange problems that arose in the past between the time the vaccines were ordered and the bill was submitted to the government.

Figure 13. The VII Revolving Fund Cycle in Morocco



Once the contract is signed and a delivery schedule prepared by UNICEF and the MOH, the government places the first of three to six orders for the year with UNICEF/Rabat. The order must be approved by UNICEF/New York to ensure that there are sufficient funds in the revolving fund to cover the purchase. The order is then sent to the UNICEF Supply Division in Copenhagen, which places the orders with suppliers. UNICEF/New York pays the suppliers for the vaccines in dollars at this time. The suppliers then arrange for the direct shipment of the vaccines to Morocco. Anywhere from two to seven separate deliveries are made for one order.

Once the vaccines are received, UNICEF/Rabat invoices the government.¹⁹ Until this year, UNICEF made out a single invoice for the entire order, which they usually did not submit to the GOM until the last delivery for that order was made. To speed up the billing and payment process, and to ensure a more regular cash flow, UNICEF started in 1998 to submit a bill for each separate delivery. The MOH pays the bill in dirham to UNICEF/Rabat, which then uses the funds for its local program costs. Upon payment, the revolving fund in New York is increased by the dollar equivalent of the payment, at the fixed exchange rate stipulated in the contract.

Since the launching of the VII in 1994, the Moroccan government has procured nearly all of its vaccines through the VII using World Bank loan funds. The only donations since 1994 have been small contributions of oral polio vaccine and some cold chain supplies from Rotary International.

As shown in Figure 8 and Table D1 in Annex D, vaccine purchases have increased steadily since the VII began. The large increase in the amount of OPV procured after 1995—when the National Immunization Days became focused on polio eradication as part of the worldwide effort—accounts for a good part of the overall rise in vaccine procurement. This increase in purchases was made possible by a doubling of the value of the VII contracts between 1994 and fiscal 1997/98, which in turn was made possible by an increase of \$500,000 in the revolving fund’s capitalization, provided by USAID in 1995.²⁰

Another important change that has occurred since the VII began is the reduction in import and other taxes imposed by the government of Morocco. Although it was assumed that the government would grant the MOH tax relief once it started purchasing vaccines through the VII, this did not occur for five years and the combination of import taxes, value-added tax (VAT), and custom duties at one point amounted to around 25 percent of the value of the imported goods. These taxes did not affect the VII contract amounts, since taxes are not included in the prices stated in the contracts. Nonetheless, they were paid from the MOH budget. In July 1997, a new law eliminated the customs duty for vaccines and reduced the import and VAT taxes to 9.75 percent.

¹⁹ Initially, UNICEF/Copenhagen prepared the invoices, but, to speed up the process, since 1995 the UNICEF/Rabat office has been doing this.

²⁰ USAID and UNICEF originally intended the added capitalization for the purchase of Hepatitis B vaccine. The NIP, however, wished to use the additional funds to buy cold chain equipment. In fact, the added funds were ultimately used for neither purpose, but went instead towards significantly increasing purchases of the traditional EPI antigens, particularly OPV.

4.3.2 Assessment of the Functioning of the VII and the Revolving Fund in Morocco

The major question to be asked in assessing the performance of the VII and its revolving fund in Morocco is whether or not the VII mechanism as it currently functions is allowing the country to purchase sufficient amounts of vaccines on a regular basis, and without major delays or ruptures in supply. Below is a summary of the findings of this assessment, which is based on VII records kept by the local UNICEF office and the NIP program. Details on the findings are found in Annex D.

4.3.2.1 Time Required to Complete the Revolving Fund Cycle

The capacity of the VII to provide regular supplies of vaccines to meet the country's needs depends on a combination of two factors: the turnover rate of the fund—that is, the amount of time it takes to complete the cycle from placing vaccine orders to the government reimbursing UNICEF—and the capitalization level. The fund in Morocco is expected to turn over two times per year, that is each cycle from the time an order is placed by UNICEF to the time the government reimburses UNICEF in dirhams should take no more than six months. With the current capitalization of \$1.1 million, this will allow the government to purchase \$2.2 million of vaccines per year, enough to meet its current needs (as discussed in Section 6.1.1).

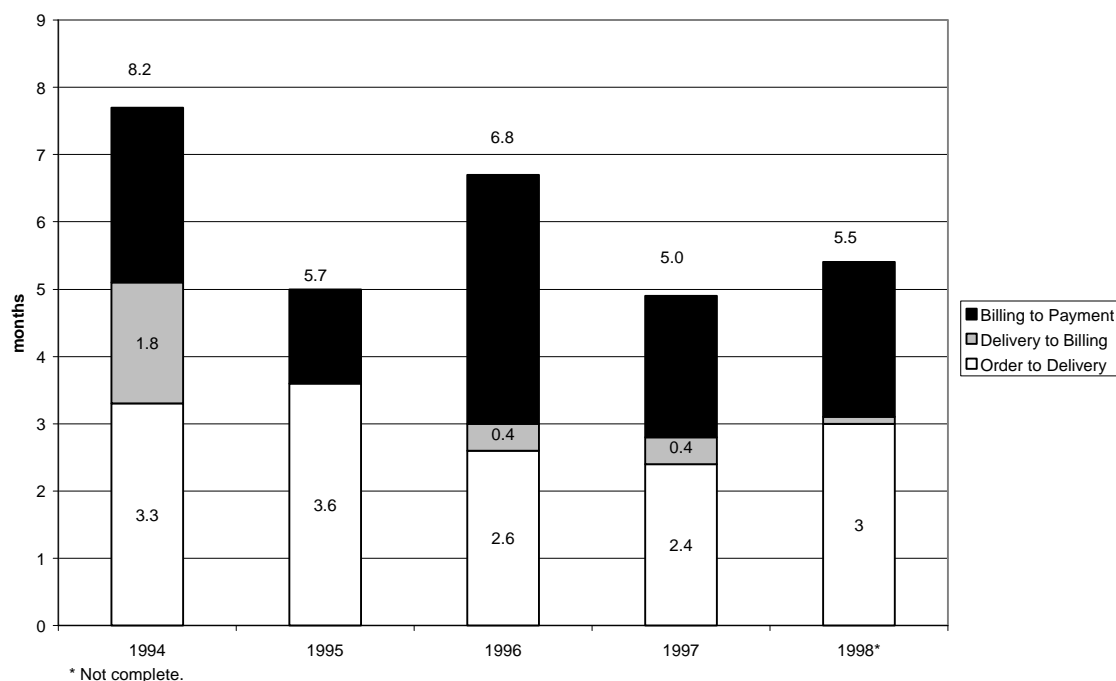
An analysis of the turnover rate shows that the average time required to complete a cycle in the past two years is 5 to 5.5 months, which is shown in Figure 14 and Table D2 in Annex D. This is down from more than eight months during the first year of the VII in 1994. As shown in the figure, it takes, on average, two-and-a-half to three-and-a-half months from the time an order is placed to the time the last delivery for that order is received. This part of the cycle has not changed much since 1994 and most likely will not, since it is largely in the hands of the suppliers. The time required for the government to receive an invoice once deliveries are made, however, has decreased significantly from almost two months when UNICEF/Copenhagen was preparing the invoices, to an average of seven days, once UNICEF/Rabat took over this task in 1995. The shortening in the invoice process, in fact, accounts for 75 percent of the reduction in the average turnover rate since 1994. Concerning the time it takes the government to reimburse UNICEF, this has averaged a little over two months (2.2) for the past two years, and has not changed significantly since 1994, when it averaged 2.6 months.

This analysis therefore shows that the revolving fund is turning over at faster than the expected rate of two times per year. This has allowed the government to purchase the amount or close to the amount of vaccines it has anticipated each year on the annual VII contracts, as shown in Table D1.

4.3.2.2 Experience with Low Balances in the Fund

To assess the performance of the VII in Morocco, in addition to looking at average turnover rates to determine if the VII mechanism can meet the country's vaccine needs, it is also important to examine whether delays in the any part of the cycle have caused the revolving fund to be depleted to the point where vaccines could not be ordered on time. A slowdown in the revolving fund cycle for any reason—delayed deliveries, delayed billing, or delays in payment—can deplete the balance in the fund and prevent needed vaccine orders from being placed.

Figure 14. VII in Morocco: Average Time Required to Complete the Revolving Fund Cycle, 1994-1998



According to the data provided by UNICEF and the NIP, on a number of occasions there was a significant delay between the time the government made a request for vaccines and UNICEF/Copenhagen placed the order. On five occasions (once in 1994, three times in 1997, and once in 1998), UNICEF did not place the actual order until one to three-and-a-half months after the initial government request. Most of these delays were due to delays in the signing of the yearly VII contracts between UNICEF and the government, since UNICEF can not use revolving fund moneys to make purchases against a new contract until the contract is fully approved. Some delays were also due to there being an insufficient balance in the revolving fund to cover the requested orders.

According to both the MOH and UNICEF, only once, in the fall of 1997, has the fund been depleted to the point where required vaccines could not be ordered in time for the NIDs, almost causing a crisis. This was due to the fact that two orders were outstanding, tying up nearly \$900,000 and leaving an insufficient balance in the revolving fund to buy needed vaccines. The slowdown in turning over these orders was due in the case of one order, to a delay in the shipment of one delivery, which slowed down the invoice and payment process for the entire order. In the other case, the delay was in the government reimbursing UNICEF, which took nearly four months once the invoice was received. A disruption in supply was averted when UNICEF placed an order on an advance basis, and the government reimbursed the fund shortly thereafter.

To help prevent further cash flow problems, UNICEF/Rabat began in 1998 to send the government invoices for each separate delivery or group of deliveries that arrived around the same time. Thus, instead of only two to four large bills being prepared a year, as in the past, five invoices in 1998 had already submitted by the end of July and all of these were paid by the end of September. If this had been the case with the fourth order of 1996/97, where one small delivery delayed billing by a month, most of the order could have been paid off sooner, and the cash flow problem could have been averted.

4.3.3 Summary and Issues for the Future

In summary, the government of Morocco has been able to significantly increase its vaccine purchases over the past five years using the VII mechanism in order to successfully implement the polio eradication campaign and to increase immunization coverage overall. Despite some operational problems, including periodic delays in shipments and in payments, both the government and UNICEF agree that the operation of the revolving fund has improved significantly over the past four years or so. Improvements in the fund's operation have been the result of flexibility on the part of both the government and UNICEF to make the program work more smoothly and to accommodate the bureaucratic requirements of both parties. These changes have included: improved billing procedures (with UNICEF/Rabat taking over this responsibility, and bills being submitted for each delivery)—which has increased the fund's turnover rate, as well as the cash flow; the inclusion of fixed exchange rates on the annual VII contracts; and the government's tax reduction for vaccines enacted last year. The VII has also greatly improved the government's ability to plan and project annual vaccine needs, which further reduces the likelihood of interruptions in supply.

One of the main benefits of the VII for countries is that it allows them to purchase vaccines with local currency. Since Morocco has an open market and therefore does not have problems obtaining hard currency, and since it buys vaccines with World Bank loan funds, which are provided in dollars, this raises the question of what the advantage of using the VII is to Morocco. The fact is that, although foreign exchange is not a problem, Morocco has amassed a large foreign debt, the equivalent of 30 percent of its budget. Therefore, using local currency to pay for the vaccines allows the government to divert precious World Bank dollars to other import needs. Once the World Bank loan ends in two years, the local currency benefit of the VII will become more important, especially as vaccine purchases increase substantially to include Hepatitis B.

Another question for the future is whether the VII mechanism will continue to best serve Morocco's needs as it expands its program to include Hepatitis B and potentially other new vaccines. This, in turn, depends on whether the government will be able to increase its vaccine budget sufficiently to cover the costs of Hepatitis B, especially if and when World Bank loan funds are no longer available to purchase vaccines. And if Morocco decides to purchase Hepatitis B through the VII, the capitalization of its revolving fund will have to be increased, which will require a contribution from one or more donors. Is going to the open market for Hepatitis B, or purchasing it through UNICEF's procurement system a better alternative? These issues will be addressed in Section 6.1.3.

5. Cost and Financing Projections for the National Immunization Program

This section projects the required expenditures and funding gap for the next five years of the National Immunization Program—both if the program continues “as is” (the “basic” program) and if improvements and changes desired by the MOH are made. As described earlier, it uses as the basis of analysis the recurrent variable non-personnel costs paid by the health sector or by donors, and excludes NIDs-related costs (i.e., transportation and personnel) that are borne by sectors other than health.

5.1 Projected Costs of the “Basic” NIP Program

The recurrent variable non-personnel costs of the “basic” program, which includes both the routine immunization activities and the National Immunization Days, are projected for the next five years in Table 18. The study team began with the 1997/98 estimated costs of the program, as described in Section 3.2, and added a 3 percent annual inflation factor for the years 1998/99 and 1999/2000. The same inflation factor is used for the next five years. The projected vaccine costs are based on the current level of purchases, not on projections of target population and vaccine wastage rates.²¹ The projections also assume that the government will continue to purchase all of its vaccines through the VII, taking advantage of UNICEF’s low prices. It is further assumed that the NIDs will continue to be implemented as they currently are, that is, twice-yearly national campaigns that focus on polio eradication and on increasing TT coverage in women of reproductive age. It is assumed that the NIDs will continue to receive considerable support from other sectors of the government and from local communities.

Assuming no changes, the program will cost the MOH around \$3 million per year, with vaccines making up almost 80 percent of these costs.

²¹ The amounts of vaccines purchased by the NIP each year are considerably higher than their estimated needs, based on population data, actual wastage rates, and a multiplier for a buffer stock. This section estimates the outlays required for vaccines for the next five years, using the NIP’s current method of estimating vaccine needs. Section 6, which discusses ways to reduce costs, presents estimations of need based on population projections and actual vaccine wastage rate, which are considerably lower.

Table 18. Projected Recurrent Variable Non-Personnel Costs of the “Basic” National Immunization Program, 1999/2000—2003/2004

Cost Component	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	Total (US\$)
Vaccines	2,352,741	2,423,323	2,496,023	2,570,904	2,648,031	12,491,021
Supplies	167,342	172,362	177,533	182,859	188,345	888,442
Vitamin A	15,633	16,102	16,585	17,083	17,596	83,000
Transportation	146,160	150,545	155,061	159,713	164,505	775,984
Maintenance/Overhead	192,205	197,972	203,911	210,028	216,329	1,020,444
IEC/Social mobilization	101,096	104,129	107,253	110,471	113,785	536,734
Short-term training	3,072	3,165	3,259	3,357	3,458	16,312
TOTAL	\$2,978,251	\$3,067,598	\$3,159,626	\$3,254,415	\$3,352,047	\$15,811,937

5.2 Projected Expenditures Required for the Planned Improvements to the NIP

5.2.1 Costs of Adding Hepatitis B

The NIP would like to begin immunizing all newborns against Hepatitis B in 1999/2000. It also plans to resume HBV immunizations for health workers, which it began, but did not complete, in the mid-1990s, as well as other high-risk groups, such as dialysis and transfusion patients and drug users. The program would like to use the DNA recombinant form of the Hepatitis B vaccine, as opposed to the less expensive plasma-derived form. The full series consists of three shots, which the NIP proposes giving to children at birth, two months, and 12 months of age, that is, at the same time as other immunizations in order to reduce delivery costs. Table 19 shows the projected costs of the HBV vaccine over the next five years, assuming that the introduction will occur nationwide from the beginning, as opposed to being phased in. These estimates are based on the projected population of newborns, the current wastage rate for DPT vaccine, and a quoted price from UNICEF of \$6.90 per vial of 10 doses, which includes all shipping, handling, and other charges. The estimated additional cost of the vaccine comes to around \$1.6 million per year, which adds an average of 53 percent to the total recurrent variable non-personnel costs of the program.

These projected costs include only the cost of the vaccine, and not other possible costs required to successfully introduce the vaccine into the NIP, such as additional costs of syringes and other vaccine supplies, the costs of training health workers to administer and store the vaccine, any additional cold chain and transportation costs to store and distribute the vaccine, and added IEC/social mobilization costs to educate the public about the new vaccine. New vaccination cards will also have to be printed. The additional supply cost of adding HBV is, however, taken into account in the cost projections for introducing single-use syringes (below and in Section 6). The additional cost of training health workers to provide Hepatitis B immunizations is also included in the projected costs of improving the disease surveillance, monitoring and reporting system (Section 5.2.4). The other possible additional costs, such as cold chain, transportation, or IEC costs, are likely to be minimal.

The projected costs also do not include immunizations for health workers and other high-risk groups, since estimates of the numbers of people involved and the percentage of health workers already immunized were not provided to the study team. Estimates of these costs would have to be added to the projected costs of immunizing all newborns.

Table 19. Projected Cost of Hepatitis B Vaccine (DNA Recombinant) for Full Introduction into Childhood Immunization Schedule, 1999/2000 to 2003/2004

Year	Target Population	Wastage Coefficient	Vials Needed (10-dose)*	Total Cost (US\$)**
1999/2000	585,627	1.39	244,206	1,685,025
2000/2001	584,675	1.39	243,809	1,682,285
2001/2002	583,254	1.39	243,217	1,678,197
2002/2003	578,693	1.39	241,315	1,665,073
2003/2004	570,830	1.39	238,036	1,642,449
TOTAL				\$8,353,029

* Based on three shots per child.

** Based on price of \$6.90 per vial.

5.2.2 Projected Expenditures Required to Upgrade the Cold Chain System in the Next Five Years

Because of the age of most refrigerators, freezers, and other cold chain equipment, as well as sterilizers, nearly all of it donated more than 10 years ago, the MOH would like to completely replace this equipment over the next several years. In addition, there are environmental benefits to be found by replacing current ozone-depleting cold chain equipment with new equipment that uses CFC-free technology. The NIP also proposes to renovate the central cold room in Casablanca, make the cold room in Rabat operational by building a back-up system, and build additional cold rooms in four regions, to begin decentralizing the storage and distribution of vaccines. The MOH will also have to equip the new health facilities that it plans to construct over the next five years—around 75 per year—with cold chain and sterilization equipment. Table 20 shows the projected outlays required for these improvements over the next five years, which comes to between \$832,00 and \$918,000 per year. The annual expenditures required to replace all existing refrigerators and other cold chain equipment within the next five years accounts for the majority (75 percent) of these costs. Details are shown in Annex E.

Table 20. Projected Expenditures Required to Upgrade the Cold Chain System, 1999/2000–2003/2004

Cold Chain Improvement	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	TOTAL (US\$)
Replacement of cold chain and other immunization-related equipment*	614,898	633,345	652,345	671,916	692,073	\$3,264,577
Equipment for new health facilities**	125,921	129,699	133,590	137,597	141,725	\$668,532
Renovation and construction of cold rooms***	92,000	77,250	79,568	81,954	84,413	\$415,185
TOTAL	\$832,819	\$840,294	\$865,503	\$891,467	\$918,211	\$4,348,294

*Includes annual costs of totally replacing all refrigerators, freezers, Vaccine carriers, and sterilizers nationwide within five years, including maintenance costs (2 percent). See Table E1 in Annex E for details.

**Based on construction of 75 new facilities per year. See Table E2 in the annex for details.

***Based on: renovating central cold room in Casablanca and building back-up facility in Rabat in 1999/2000 and constructing one regional cold room per year from 2000/2001 to 2003/2004. See Table E3 in the annex for details.

An inflation factor of 3 percent per year is used for all estimates.

5.2.3 Additional Costs of Introducing Auto-Destruct Syringes

To ensure vaccine safety, the NIP would like to introduce single-use syringes. One type of single-use syringe is the auto-destruct syringe, in which the needle cannot be drawn out after use. The projected cost of introducing auto-destruct syringes for all antigens, including Hepatitis B, and including the cost of disposal boxes for used syringes, is shown in Table 21. These projections are based on projections of the target population of newborns and the number of doses required for each vaccine. These estimates, however, do not include other costs that will be required for safe disposal, such as the costs of establishing an incinerator system and the costs associated with the collection and incineration of the used syringes (e.g., transport, staff). It is beyond the scope of this study to estimate the additional costs of proper syringe disposal; however, they are likely to contribute significantly to both the recurrent and capital costs of the immunization program. Not taking these additional disposal costs into account, the added costs of using auto-destruct syringes for all vaccines, including Hepatitis B, are estimated at around \$560,000 per year, for a total of \$2.8 million over five years.

Table 21. Projected Additional Cost of Introducing Auto-Destruct Syringes for all Antigens, including Hepatitis B (US\$)

Year	Total No. of Syringes Needed	Total Cost*	Annual Cost of Sterilizable Syringes**	Additional Cost of Auto-Destruct Syringes
1999/2000	7,390,096	591,208	32,761	558,447
2000/2001	7,449,533	595,963	33,861	562,101
2001/2002	7,501,433	600,115	34,999	565,116
2002/2003	7,524,602	601,968	36,175	565,793
2003/2004	7,517,731	601,418	37,391	564,028
TOTAL		\$ 2,990,672	\$175,187	\$2,815,485

*Based on 1998 price of \$0.08 for syringes and includes cost of disposal boxes (\$0.85 each).

**From 1997 annual costs. Includes syringes, needles, sterilizers, joints, timers and maintenance for sterilizers. Inflation factor of 3.36 percent per year is used.

5.2.4 Costs of Improving Immunization Coverage

As mentioned in Section 1.5, one of the immunization program's goals is to attain coverage for all vaccines provided by the NIP to 95 percent of children under age one in all of the country's provinces and prefectures. At present, while many localities, especially urban areas, have coverage rates equal to or greater than 95 percent, a substantial number, especially isolated rural areas have considerably lower rates.

In the past 10 years, the NIP has used the National Immunization Days as a major means of increasing immunization coverage in the rural, hard-to-reach areas of the country. This has been the case since access to basic health services in these areas continues to be poor and since the number of mobile nurses has decreased considerably in the last 10 years. In addition, the use of mobile health teams to deliver immunization and other basic health services on a periodic basis also varies considerably from one area to the next and depends on the availability of local vehicles and equipment.

Since the NIDs are resource-intense and less cost-effective than routine health services in delivering immunizations, and they only take place in November and December of each year, a more

effective and efficient strategy to increase coverage in the rural, isolated areas will require a more local approach. Such an approach could involve:

- ▲ Reactivating mobile health teams and mobile nurses;
- ▲ Organizing, at the local level, mini-campaigns and campaigns targeted to specific populations, which can be adapted to meet the specific environmental and cultural needs of each area;
- ▲ Studying the factors related to people's acceptance and access to immunization services in order to improve the effectiveness and efficiency of strategies to increase coverage.

The costs involved to implement such an approach would mainly consist of transportation costs, travel costs for personnel, and social mobilization and IEC costs. It was not possible to estimate the additional costs of increasing coverage for this study, mainly because accurate coverage data per province are not currently available, since administrative reports provided to the NIP show rates that are considered inflated. Further research is needed to determine what the best approaches to increase coverage would be and thus, what the added costs would be. Improving the accuracy of routine immunization reports to obtain more accurate coverage data, as discussed below, will be an important step in determining these costs.

5.2.5 Projected Costs of Improving Disease Surveillance, Management Information System, Monitoring/Supervision and Research

According to the draft five-year plan prepared by its Population Division, the MOH plans to improve the current system of disease surveillance and control, the monitoring and supervision of immunization activities, and the management information system used for immunization activities. The MOH also plans to carry out a number of applied research studies related to immunizations.

To improve disease surveillance and control, the plans call for two regional trainings of trainers per year for SIAAP (provincial-level) personnel (the chief medical officer, NIP coordinator and epidemiological surveillance coordinator), who will in turn hold province-level training sessions for health personnel. The training will focus on new materials and methods of surveillance of polio, as well as surveillance of measles, neonatal tetanus, and Hepatitis B. The estimated cost of improving this system will include the design and dissemination of new guidelines, periodic surveys, as well as the costs of the trainings and meetings.

Improving the monitoring and supervision of immunization activities will involve training the provincial-level NIP coordinators in supervision, monitoring local activities by the NIP coordinators, evaluations of NIDs and mini-campaigns, and periodic field visits and audits by central-level NIP staff. The cost involved consists mainly of travel and per diem costs for both the training and monitoring activities.

For the MIS, the MOH would like to improve management and tracking of vaccine supplies and equipment, including cold chain equipment. This will involve improving the system of reporting immunizations delivered on a routine basis and during the NIDs, since routine vaccination statistics coming from the provinces are considered substantially inflated. The cost of improving the MIS over the next five years involves the cost of technical assistance to design computer programs, the cost of training NIP and local-level personnel, the cost of new reporting forms from clinics, and the cost of additional computers.

To further increase knowledge related to immunizations, the MOH also plans to conduct a number of applied research studies. Some of the suggested areas of study include: injection safety practices, wastage rates of vaccines and supplies, the impact of IEC campaigns on increasing demand for immunizations and on coverage, and the incidence of meningitis caused by Hib. Mainly local researchers, including those from local universities will conduct these studies.

The estimated costs of these improvements are based on the projections made by NIP staff, and were adjusted as needed. The estimated costs are shown in Table 22.

Table 22. Estimated Costs of Improvements to Disease Surveillance System, Management Information System and Supervision/Evaluation, 1999/2000—2003/2004

Activity/System	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	TOTAL (US\$)
MIS	61,053	62,884	64,771	66,714	68,715	\$324,137
Disease Surveillance/Control	33,684	34,695	35,736	36,808	37,912	\$178,835
Supervision/Evaluation	35,789	36,863	37,969	39,108	40,281	\$190,010
Applied Research	27,368	28,189	29,035	29,906	30,803	\$145,301
TOTAL	\$157,895	\$162,632	\$167,511	\$172,536	\$177,712	\$838,283

5.2.6 Summary of Estimated Expenditures Required for the Planned Improvements of the NIP

The outlays required for the NIP program over the next five years, with the improvements desired by the Ministry of Health are shown in Table 23. These improvements will more than double the program's expenditures, from around \$3 million per year to over \$6 million. The addition of Hepatitis B into the program accounts for 50-52 percent of the increase, with the upgrading of the cold chain system accounting for another 26-28 percent.

Table 23. Projected Expenditures of the National Immunization Program with Planned Improvements, 1999/2000–2003/2004

Improvement/ Addition	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	Total (US\$)
"Basic" Program	2,978,251	3,067,598	3,159,626	3,254,415	3,352,047	\$15,811,937
Hepatitis B vaccine (full introduction)	1,685,025	1,682,285	1,678,197	1,665,073	1,642,449	\$8,353,029
Cold chain system improvements	832,819	840,294	865,503	891,467	918,211	\$4,348,294
Additional cost of auto-destruct syringes	558,447	562,101	565,116	565,793	564,028	\$2,815,485
Surveillance/Reporting system improvements	\$157,895	\$162,632	\$167,511	\$172,536	\$177,712	\$838,283
TOTAL	\$6,212,436	\$6,314,910	\$6,435,952	\$6,549,284	\$6,654,447	\$32,167,029
Total as % of current program	209%	206%	204%	201%	199%	203%

5.3 Projected NIP Budget and Funding Gap for the Next Five Years

This section analyzes the ability of the current financing system to bear the expected financial outlays required over the next five years, by projecting the expected funding available and the gap between this funding and the required expenditures discussed in the above section.

5.3.1 Projected Financing for the NIP

To estimate the current government funding for the immunization program, the study team used the estimated recurrent variable non-personnel costs as a basis and subtracted the costs for which donors have traditionally paid: IEC/social mobilization, short-term training, and Vitamin A supplements. The team used the costs as a basis, as opposed to the NIP budget, since, as mentioned in Section 4.2.1.2, the NIP part of the investment budget published by the MOH only includes certain items, such as vaccines and some transportation costs, and not all of the actual expenses incurred by the program.

To project available government funding for the immunization program for the next five years, two possible scenarios are presented (see Table 24). As mentioned earlier, the current World Bank loan program (BAJ1), which funds most of the program's recurrent non-personnel costs, is scheduled to end in fiscal 2000/2001 and it is not yet known if there will be a follow-on program (BAJ2). Therefore, one scenario assumes that World Bank funds will continue to be available to the immunization program after 2000/2001 at the same level as they are currently. The second scenario assumes that Bank funds will not be available for the program after that year, and that the government will need to pick up these costs or find other funding sources. Both scenarios project an annual increase in the government's funding to the NIP of 10 percent, based on the yearly increases of the entire MOH budget over the past 10 years.

Table 24. Projected Government Funding for Recurrent Variable Non-Personnel Expenditures for the Immunization Program, 1999/2000—2003/2004, under Two Scenarios (US\$)*

Scenario	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	Total (US\$)
Projected funding assuming continued World Bank financing after 2000/2001	3,022,758	3,325,034	3,657,537	4,023,291	4,425,620	\$18,454,240
Projected funding assuming no World Bank financing after 2000/2001	3,022,758	3,325,034	954,225	1,238,879	1,557,676	\$9,798,572

* Assumes a 10 percent annual increase in government allocations to the NIP.

As the table shows, if World Bank loan funds are not available to cover the program's expenditures after the year 2000/2001, this will cut current funding by 64 percent to 74 percent and the government will need to make up the difference somehow. The following section discusses the projected gap between available government funding for the next five years (with and without World Bank funding) and the financial outlays required for both the current immunization program and the program with improvements desired by the Ministry of Health.

5.3.2 Projected Funding Gap

Figures 15 and 16 show the difference between projected required expenditures and projected funding of the “basic” program and the program with planned improvements, respectively. Details are provided in Table E4 in Annex E. If the program remains the same and World Bank funds continue to be available for its use for the next five years, the analysis shows that there should be sufficient funding for the program. The analysis actually projects a surplus, since a 10 percent annual increase in government funding and only a 3 percent inflation rate are assumed. In reality, the surplus would likely be directed to other health programs or the funding reduced. If, however, World Bank loan funds are no longer available to the NIP after the BAJ1 program ends in two years, the government will have to find around \$2 million in additional financing per year after that, just to maintain the current program. Again, the projected financing does not include any donor funding that may be made available. This \$2 million gap represents 0.5 percent of the Ministry of Health budget (for 1997/98) and is the equivalent of \$.07 (DH .67) per capita.

The additional expenditures required for the planned improvements will create a funding gap of between \$2.2 million and \$3.2 million per year, unless additional funds from the government or from other sources can be found. If World Bank loan funds can no longer be used by the NIP after 2000/2001, this gap will increase to \$5 million or more per year. Clearly, if the MOH plans on implementing these changes, it will either have to mobilize additional funds, reduce program costs, rationalize or phase in the desired changes, or, most likely, do all of the above. The various options for financing the program in a sustainable way, while still enacting the planned improvements and changes are discussed in detail in the next section.

Figure 15. Required Expenditures vs. Projected Government Funding of the “Basic” Immunization Program

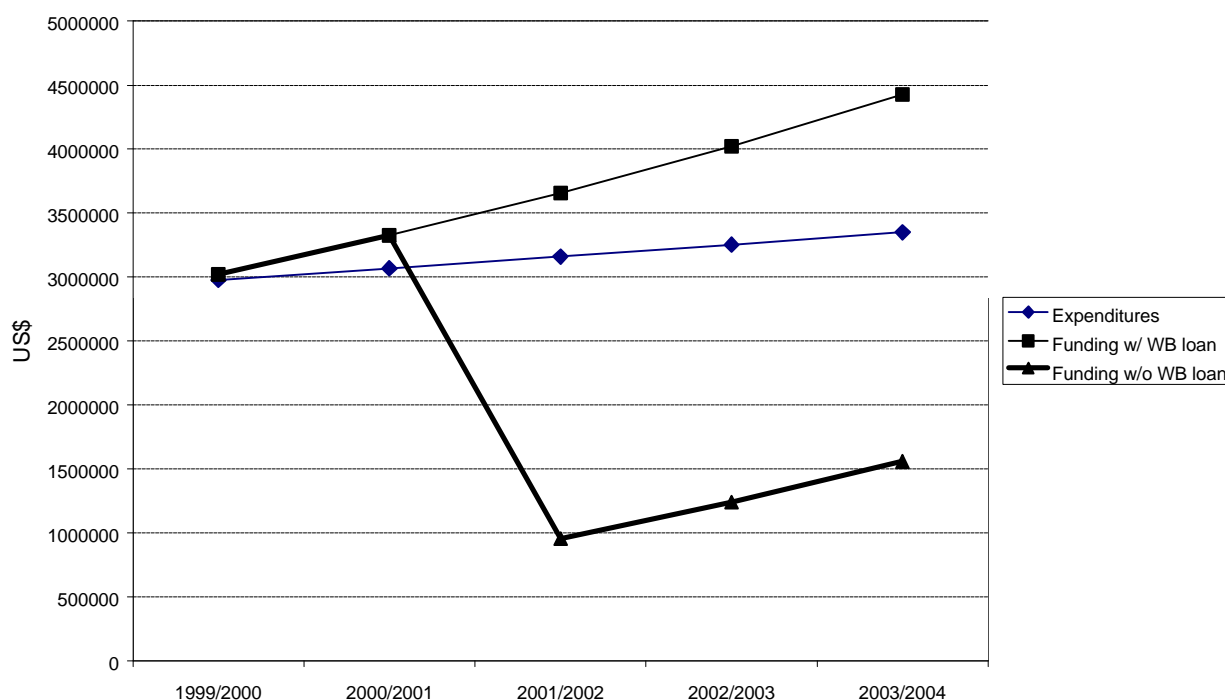
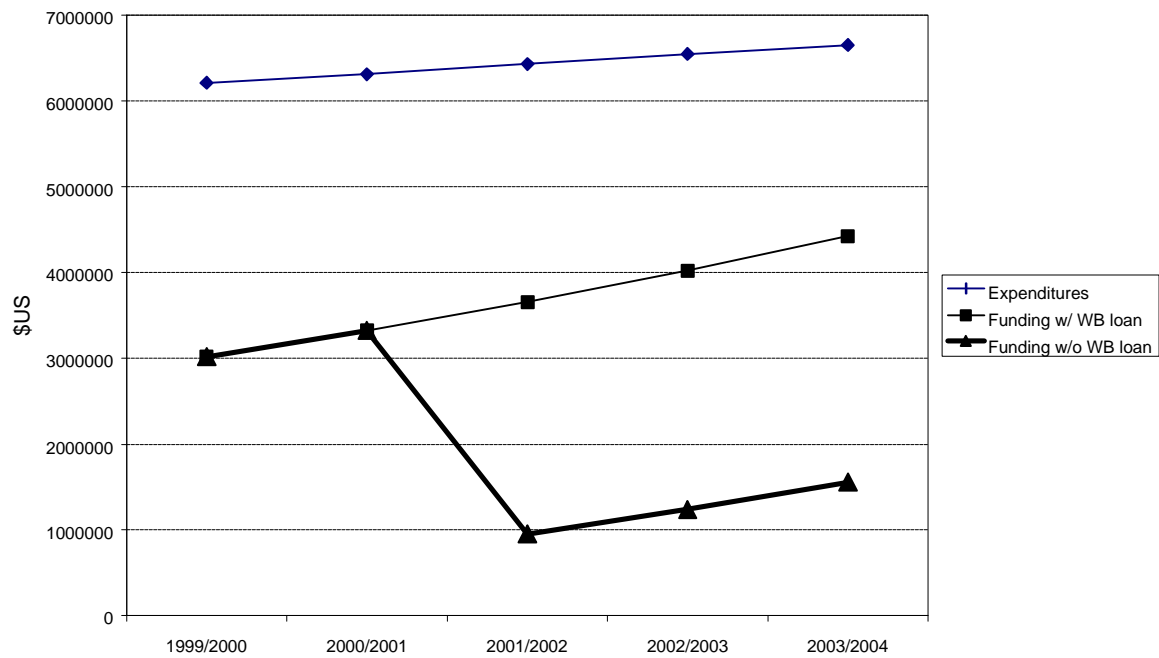


Figure 16. Required Expenditures vs. Projected Government Funding of the Immunization Program with Planned Improvements



6. Options for Building a Sustainable Immunization Program in Morocco

As seen in Section 5, Morocco's National Immunization Program faces enormous challenges in the next five years, as its major funding source—the World Bank BAJ1 loan—comes to an end, as it introduces Hepatitis B and makes other important improvements that will effectively double the program expenditures, and as it tries to increase immunization coverage and reduce inequities between regions. How can the Ministry of Health close the projected funding gap, which, with the intended program improvements, grows to more than \$5 million a year beginning in 2001/02?

This section discusses three strategies to help close this gap. The three will likely have to be enacted in combination. They are: (1) reducing the current and future costs of the program without compromising quality and while attaining targeted improvements; (2) rationalizing and/or phasing in some of the program improvements; and (3) changing the mix of financing strategies in order to mobilize additional resources for the program.

6.1 Ways to Reduce Current and Future Program Costs

6.1.1 Improving Methods of Projecting Vaccine Needs and Stock Management

As shown in Section 3, vaccine costs, based on the number of doses delivered by the NIP to the provincial health authorities, came to around \$2.2 million 1997/98. To estimate vaccine needs, the NIP uses a target population figure of 650,000 as the birth cohort per year. It then adds a factor for wastage, using standard WHO wastage rates of 50 percent for BCG and 25 percent for the other vaccines. On top of this, a factor of 25 percent is added as a buffer stock, to ensure sufficient vaccine supplies in the country at all times.

There are a number of problems with this method. First, the current population base is lower than the target figure used by the NIP. The estimated number of newborns in 1999, which is the base for BCG, is 629,707, and the number of children under one year of age, the base population for the other vaccines, is around 585,600, taking infant mortality into account. These numbers will also decrease slightly each coming year, due to continuous declines in the birth rate in Morocco. Second, the wastage rates and buffer stock coefficients used by the NIP to estimate needs are quite different than the actual rates observed for 1997/98, which are based on the number of vaccines delivered vs. the number actually administered, according to NIP reports. In some cases, such as BCG and measles, the observed rates are actually higher than the WHO standard wastage rates, while, for some other vaccines, they are lower than or fairly close to the standard rate. As shown in Table 25, the observed wastage rate was 74 percent for BCG and 60 percent for measles. These translate into wastage coefficients that are, in both cases, more than 50 percent higher than the coefficients used by the NIP, which combine the WHO wastage rates and a buffer stock rate of 25 percent. On the other hand, according to these figures, the NIP overestimates its wastage and buffer stock needs for polio by 51 percent. Given the huge number of doses of OPV administered as a result of the polio eradication campaign, using a more accurate wastage coefficient can result in substantial savings in OPV costs

over time. A third problem stems from the fact that stocks of vaccines already held are apparently not taken into account when the NIP determines its vaccine needs for the coming year.

Table 25. Comparison of Observed and WHO Standard Rates for Vaccine Wastage, 1997

Vaccine	Observed (1997)		Rates Used by NIP to Estimate Need			Difference between Observed and Standard Coefficients
	Wastage Rate*	Wastage Coefficient**	WHO Wastage Rate	Buffer Stock Factor	Wastage + Buffer Stock Coefficient	
BCG	74%	3.85	50%	25%	2.50	+54%
DPT	28%	1.39	25%	25%	1.66	-19%
OPV	9%	1.10	25%	25%	1.66	-51%
Measles	60%	2.50	25%	25%	1.66	+51%
TT	22%	1.28	25%	25%	1.66	-30%

*Based on the ratio of vaccines delivered to provinces to the vaccines administered, from NIP reports. Any buffer stocks are included in the wastage rate.

** Wastage coefficient = $1/(1-\text{wastage rate})$.

Using population projections, based on MOH data, an assumption of 100 percent coverage, and the observed wastage rates for 1997, the study estimated needs for the current EPI vaccines for 1999/2000 as shown in Table 26.

Table 26. Projected Vaccine Needs for 1999/2000, using the Population-Based Method and Observed Wastage Rates, and assuming 100% Coverage

Vaccine	Target Population	No. of Doses in Schedule or per Year	Additional Factor Required for NIDS and Mop-Up Campaigns	Observed Wastage Coefficient	No. Doses Required	No. Vials*	Price/Vial (US\$)	Total Cost (US\$)
BCG	629,707	1	1.0128	3.85	2,455,404	122,777		158,382
DPT	585,627	3	1.049	1.39	2,562,551	256,255		220,379
OPV	585,627	4	2.195	1.10	5,656,770	565,677		554,363
Measles	585,627	1	1.143	2.50	1,673,850	167,385		230,991
TT**	2,661,000	1	—	1.28	3,406,080	340,608		187,334
TOTAL								\$1,351,451

*Vials for all vaccines contain 10 doses, except BCG, which contains 20 doses.

**Target population for TT is 37.5 percent of all women 15-44 years old, based on the activity data for the last three years. Although the total series over the course of a women's lifetime is five doses, one dose administered per year is assumed.²²

²² As far as women in child-bearing age are concerned, one has to consider a minimum of three-year program to achieve TT5 coverage. The estimation of the target population (when considering all five shots) is calculated using the activity data of the last three years (37.5 percent of the total women population in this age group). The researchers did not computerize any correction factor that should have been included in the calculations since 1995, so to speak taking into account the successive cohorts of girls covered by the DPT immunization since 1981. But to stay on the safe side as far as protecting newborns from tetanus is concerned, and considering the low proportion of women with vaccination documents (27 percent of them in 1994 survey), it seems more preferable to still keep the same means to calculate needs for TT vaccination.

The total estimated cost for the basic EPI antigens for 1999/2000 comes to \$1.35 million. This compares to an estimated cost of vaccines in 1997/98 of \$2.2 million, as seen in Section 3.2. Thus, the projected vaccine costs, using the population-based method of estimated need and observed wastage rates is 39 percent less than the current actual cost of vaccines to the government. What accounts for this large difference?

There appears to be a tendency to overestimate the buffer stock in order to be prepared for any disruptions or delivery delays. One reason for the higher actual costs is that the NIP uses higher target population figures and wastage rate coefficients that differ substantially from coefficients derived from actual wastage rates in Morocco. However, it is likely that overstocks of vaccines account for much of the difference between what the MOH has been spending on vaccines per year and what the study team estimated they need to spend. It is not clear if overstocking occurs mainly at the central, provincial or local level. The fact that vaccine orders by the MOH to UNICEF do not appear to take into account stocks at hand undoubtedly contributes to this. At the provincial (SIAAP) level, the NIP delivers vaccines every two months, based on reports from each province of stock on-hand and estimated need. However, from discussions with provincial-level personnel, it appears that the provinces tend to underreport current stocks on hand and overestimate their needs, to prevent possible stock-outs, since deliveries from the central level are not always regular.

In any event, if the NIP adopts the population-based method of estimating vaccine needs and applies actual instead of theoretical wastage coefficients, it should be able to reduce the current estimated costs from \$2.2 million to closer to \$1.35 million, a yearly savings of around \$866,000.

The estimated vaccine needs for the next five years, based on the population-based method, are shown below in Table 27.

Table 27. Estimated Requirements for the Basic EPI Vaccines, 1999/2000 to 2003/2004, using the Population-Based Method of Estimating Need and Observed Wastage Rates

Year	BCG Vials Needed	DPT Vials Needed	OPV Vials Needed	Measles Vials Needed	TT Vials Needed	Total Cost of Vaccines (US\$)
1999/2000	122,777	256,255	565,677	167,385	340,608	\$1,351,451
2000/2001	122,580	255,858	565,257	167,298	349,201	\$1,355,050
2001/2002	122,284	255,266	564,633	166,943	357,312	\$1,357,518
2002/2003	121,341	253,363	562,626	165,803	364,992	\$1,355,349
2003/2004	119,712	250,084	559,166	163,835	372,241	\$1,348,308
TOTAL						\$6,767,676

1998-99 prices per vial: BCG \$1.29; DPT \$0.86; OPV \$0.98; Measles \$1.38; TT \$0.55
1998 wastage coefficients: BCG 3.85; DPT 1.39; OPV 1.1; Measles 2.5; TT 1.28

6.1.2 Reducing Vaccine Wastage Rates

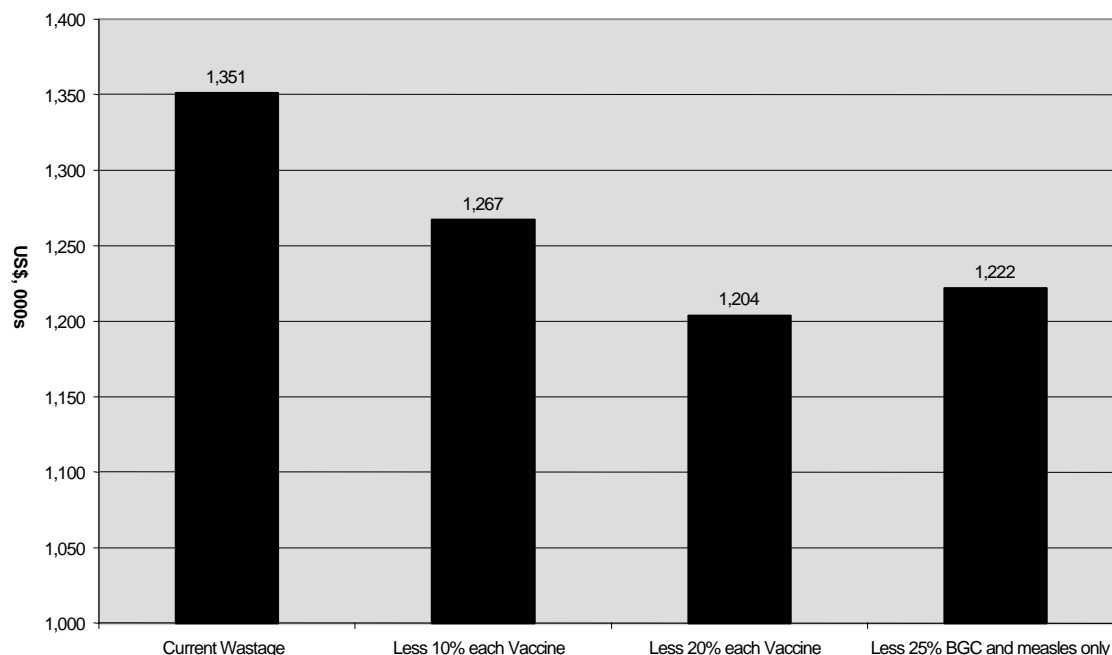
As discussed in Section 1.4.2, once Morocco introduced the open-vial policy in 1996 for DPT, TT and OPV—the vaccines that do not require reconstituting—the wastage rates for these vaccines declined—significantly in the case of DPT and TT, and slightly in the case of OPV. The observed wastage rates for DPT and TT in 1998 (25 percent and 23 percent, respectively) are now close to the standard WHO rate of 25 percent for both of these antigens. At 10 percent, the actual wastage rate for OPV observed in 1998 is significantly lower than the standard 25 percent rate. This is likely due, in large part, to the fact that 70 percent of all doses of OPV administered in a year is given out during

the NIDs. Since the number of doses administered in a single day at a given delivery point will be much greater during the NIDs than in the routine program during the rest of the year, this results in greater efficiency and thus less wastage.

The wastage rates for BCG and measles, however, at 74 percent and 60 percent respectively, have remained quite high. In fact, in the case of BCG the rate has actually increased from around 68 percent in 1994 to 74 percent in 1998. While the open vial policy cannot be used for these vaccines, since they are reconstituted and reusing them the next day could result in contamination, these wastage rates are still significantly higher than the WHO standard rates of 50-90 percent for BCG and 25-50 percent for measles (CIDEF, 1998).

If the NIP is able to reduce the vaccine wastage rates further without cutting back on vaccination services, this can result in significant cost savings, as shown in Figure 17 and Tables F1–F3 in Annex F. If the program is able to reduce the current wastage rates by 10 percent for each vaccine, this will save the MOH more than \$84,000 per year, around 6 percent of the annual projected vaccine costs. If wastage rates can be reduced 20 percent for each vaccine, the cost savings will be around \$148,000 per year. And if the program only focuses on reducing wastage for BCG and measles—say by a maximum of 25 percent—this will create savings of around \$129,000 per year, nearly 10 percent of the annual vaccine costs.

Figure 17. Projected Vaccine Costs for 1999/2000 with Reductions in Wastage Rates, \$US (000s)



However, the reasons for the current wastage rates are not well known (i.e. losses at the time of usage or from transportation and storage) and would have to be investigated before it can be determined if significant reductions in vaccine wastage can be achieved without lowering immunization coverage. Coverage could decline, for instance, if the number of sessions per week during which measles and BCG were given was reduced in an effort to reduce wastage. Therefore, further study into the current policies and practices regarding vaccine use is required before any efforts to reduce vaccine wastage can be made.

6.1.3 Use of the Vaccine Independence Initiative vs. other Options for Procuring Hepatitis B Vaccine

Morocco currently buys all of its vaccines through the VII, which has allowed the country access to high-quality, low-cost vaccines through UNICEF's Procurement System and to purchase the vaccines in local currency and only once deliveries are made. As discussed in Section 4.3.4, despite some past problems with the turnover rate of the revolving fund, due to shipping or payment delays, this mechanism has worked fairly well overall and has allowed the government to greatly increase its vaccine purchases over the past five years, without ever defaulting on a payment. The MOH has expressed its interest in continuing to use the VII to purchase the basic EPI vaccines, especially since the operation of the revolving fund has improved in the past few years.

The main issue currently facing the MOH and USAID/Rabat concerning the VII is whether the government should purchase Hepatitis B vaccine through this mechanism. The questions being raised are:

- ▲ How much will the capitalization of the revolving fund have to be increased by to include the purchase of HBV?
- ▲ What are the alternatives to procuring through the VII? Is purchasing HBV on the open market potentially more economical and if so, what will this require?

Each of these questions is addressed below.

6.1.3.1 Use of the VII Revolving Fund to Purchase Hepatitis B Vaccine

The estimated cost of vaccines for the next five years, if recombinant DNA Hepatitis B vaccine is introduced nationwide beginning in 1999/2000 to cover all newborns, is shown in Table 28 below. These estimates use UNICEF prices for 1998/99, the population-based method of determining need, and actual vaccine wastage rates in Morocco.

Table 28. Projected Cost of Vaccines, including Hepatitis B (Recombinant DNA), 1999/2000–2003/2004, Based on 100% Coverage, US\$

Vaccine	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	Total (US\$)
Hepatitis B (Recombinant DNA)*	1,685,025	1,682,285	1,678,197	1,665,073	1,642,449	\$8,353,029
All other EPI vaccines**	1,351,451	1,355,050	1,357,518	1,355,349	1,348,308	\$6,767,676
TOTAL	\$3,036,476	\$3,037,335	\$3,035,715	\$3,020,422	\$2,990,757	\$15,120,705

* Based on estimated number of vials needed to immunize all newborns and on quoted UNICEF price of \$6.90/vial, including all charges. Assumes the same vaccine wastage rate (28 percent) as for DPT in Morocco. (See Table 19)

** Based on current UNICEF prices and actual wastage rates. See Table 27.

As the table shows, the vaccine costs will be around \$3 million per year, and decrease slightly each year due to declines in the birth rate. The Hepatitis B vaccine, if the recombinant DNA version is used, will actually cost more (around \$1.7 million) per year than all of the other vaccines put together (around \$1.3 million).

With the current capitalization of \$1.1 million in the revolving fund and two turnovers of the fund per year, Morocco is currently able to purchase \$2.2 million of vaccines per year through this mechanism. Assuming the NIP adopts the population-based method of estimating vaccine needs and reduces its buffer stocks, buying Hepatitis B vaccine will only mean an increase in purchases of around \$830,000 per year (\$3,030,000-\$2,200,000). What will this mean in terms of capitalizing the revolving fund?

As discussed in Section 4.3, the total purchases that can be made through the VII is both a function of the capitalization amount in the revolving fund and the fund's turnover rate. If the turnover rate could increase from two times per year to three times, this would allow the government to purchase \$3.3 million worth of vaccines per year (\$1.1 million x 3), enough to cover the additional cost of the recombinant DNA Hepatitis B vaccine without adding more capital to the fund. However, both the Ministry of Health and UNICEF feel that reducing the total cycle time to four months (i.e., three cycles per year) is unlikely. This is because the average time required from the placement of the order by UNICEF to the arrival of the vaccines in the last two years was just under three months, and since this is largely in the hands of suppliers, this period of time is unlikely to be reduced significantly. Therefore, to reduce the cycle to four months would require shortening the invoice-payment time. The MOH has already reduced the time it takes to reimburse UNICEF to just a little over two months, and feels that further reductions, given the government bureaucracy, are not possible. Thus, the time required to complete one cycle (from order to payment) is still at least five months, and therefore, only two turnovers of the fund can be expected per year.

Assuming two turnovers per year of the revolving fund, the increase in annual vaccine purchases of around \$830,000 to include Hepatitis B will require increasing the capitalization in the fund by about \$415,000. This would bring the fund total to \$1,515,000, allowing \$3,030,000 in vaccine purchases to be made per year. Of course, this scenario assumes that the government will increase its budget sufficiently to cover the additional cost of the Hepatitis B vaccine, as well as the other vaccines.

If, on the other hand, the NIP's methods of estimating vaccine needs and managing stock do not change, the total amount of vaccine purchases to be made per year will be around \$3.7 (\$2.2 million for the current vaccines and \$1.7 million for HBV). With two fund turnovers per year, the required capitalization for this level of purchases will be \$1.85 million, which is \$750,000 more than is currently in the revolving fund.

Increasing the annual purchases made through the VII will require the UNICEF program in Morocco to absorb this increase in local currency. At present, UNICEF has an agreement with the local UNDP office to sell them excess local currency, as needed. According to the UNICEF representative in Rabat, similar agreements could be worked out with UNFPA and other U.N. agencies operating in Morocco. He therefore felt that, with appropriate planning, the issue of local currency absorption capacity could be resolved and should not present a serious obstacle to the inclusion of Hepatitis B vaccine in the VII.

6.1.3.2 Alternatives to Using the VII to Purchase Hepatitis B Vaccine

If Morocco has difficulty raising funds to increase the capitalization of the revolving fund, one alternative is to purchase HBV through UNICEF's Procurement System, not using the VII mechanism. This will allow the government to continue to benefit from UNICEF's relatively low prices and ensures high quality of the vaccines. However, the UNICEF Procurement System requires payment in hard currency and in advance of delivery. The Moroccan government would therefore have to obtain sufficient amounts of hard currency to pay for Hepatitis B—around \$1.7 million per

A further alternative being considered by the NIP is to purchase HBV in the open market through either an international tender and bid process or direct deals with suppliers. In fact, many countries originally targeted for the VII, including Egypt, Pakistan, Nepal, and Zimbabwe, chose this option instead. One price obtained from a Korean supplier for recombinant DNA vaccine with all charges included was \$0.98/dose, considerably more than the \$0.69 per dose quote from UNICEF. An international bidding process, as well as multi-year contracts could bring down this price considerably; however, it seems unlikely that the Moroccan government can beat the UNICEF price by going on the open market. In addition, purchasing directly through a supplier will require the MOH to obtain sufficient amounts of hard currency and to pay in advance of deliveries. A further requirement of purchasing vaccines on the open market is the establishment of a national control authority for biological products, as recommended by WHO and UNICEF. Given the fact that time is required to prepare an international tender and bid and to establish and train the control authority, and given the reasonable prices obtained through UNICEF, Morocco should plan to buy HBV through UNICEF using the VII mechanism, at least for the first few years.

6.1.4 Hepatitis B Vaccine Alternatives

For the introduction of Hepatitis B, the NIP plans on purchasing the recombinant DNA vaccine to be administered separately (as opposed to in combination with other antigens). The vaccine cost estimates shown in Table 19 in Section 5.2.1 are based on a price recently quotes to UNICEF/Rabat of \$0.69 per dose, including all charges. However, there are two alternatives to using the monovalent recombinant vaccine to consider.

The first is to use the plasma-derived vaccine, which is equally effective, immunogenic, and safe, but costs around 20 percent less than the recombinant DNA type. UNICEF quotes a price of \$5.49 per vial for the plasma-derived vaccine, with all charges, vs. \$6.90 for the recombinant DNA vaccine. As shown in Table 29, if the program immunizes all newborns nationwide beginning this year, it can save an estimated \$344,000 in 1999/2000 by using plasma-derived HBV. Over the course of five years, these savings would total around \$1.7 million. These estimates are based on an assumed wastage rate of HBV equivalent to DPT (28 percent).²³

The second alternative would be to use a combination DPT-HBV vaccine, which has the recombinant DNA type of HBV. One estimated price of this combination offered to UNICEF in 1997 for a bi-annual tender was \$0.90 per dose for 10-dose vials (for Tritanrix-HB). This would cost Morocco \$2.3 million per year or around \$400,000 more than HBV and DPT purchased separately at the recently quoted UNICEF prices. Even with cost savings from using fewer syringes estimated at \$80,000 to \$140,000, this option would be more costly than buying DPT and HBV separately through

²³ It should be noted that the Scientific and Technical Immunization Committee has recommended that the recombinant DNA vaccine be used.

UNICEF, and thus not advantageous. Another factor to consider is the fact that the schedule for DPT and HBV are different.

Table 29. Cost Comparison between Difference Types of Hepatitis B Vaccine (HBV) for 1999/2000

Type of HBV	No. Vials Needed	Price/Vial (US\$)	Total Cost (US\$)
Recombinant DNA	244,206	\$6.90	\$1,685,025
Plasma	244,206	\$5.49	1,340,691
Cost savings using plasma-derived HBV			\$344,334

6.1.5 Using Alternative Single-Use Syringes

Section 5.2.3 estimated the additional cost of using auto-destruct syringes over regular sterilizable syringes to be around \$560,000 per year, or \$2.8 million over five years. A less expensive option would be to introduce regular disposable syringes, which cost \$0.04-\$0.06 a piece, compared to around \$0.08 for the auto-destruct syringes. Given the millions of syringes needed per year for the entire series of vaccinations, including Hepatitis B, using regular disposable over auto-destruct syringes can cut the additional costs by \$240,000 per year, or \$1.2 million over five years, a savings of 40 percent. These estimates are shown in Table 30. However, it is important to note that regular disposable syringes make it necessary to verify that a proper disposal system is in place before introduction. This point needs to be considered in the discussion of cost savings when using regular disposable rather than auto-destruct syringes.

Table 30. Additional Cost of Auto-Destruct and Regular Disposable Syringes, 1999/2000-2003/2004 (US\$)

Year	No. Syringes Needed*	Additional Cost of Auto-Destruct Syringes (over Sterilizables)**	Additional Cost of Regular Disposable Syringes***	Cost Savings using Disposable vs. Auto-Destruct Syringes
1999/2000	7,340,096	\$558,447	\$317,972	\$240,475
2000/2001	7,449,533	562,101	319,552	242,549
2001/2002	7,501,433	565,116	320,741	244,375
2002/2003	7,524,602	565,793	320,506	245,287
2003/2004	7,517,731	564,028	318,783	254,245
TOTAL		\$2,815,485	\$1,597,554	\$1,217,931

* Includes Hepatitis B requirements.

** Additional costs are costs over and above the cost of sterilizable syringes currently being used. 1998 price for all syringes is \$0.08, which includes disposal boxes.

*** 1998 prices for regular disposable: \$0.06 for BCG; \$0.037 for others; \$0.85 for disposal box.

6.1.6 Summary of Potential Cost Savings

Table 31 sums up the potential cost savings to the National Immunization Program, based on the projected costs of the expanded and improved program. By adopting measures to reduce vaccine purchases and choosing lower cost alternatives for Hepatitis B vaccine and single-use syringes, the program can theoretically spend around \$960,000 to \$1.5 million less than projected per year for the next five years, a savings of 15 percent to 25 percent over the estimated required annual expenditures.

Although it is unlikely that the NIP will adopt all of these cost saving measures, certain ones, especially improving vaccine needs projection methods, are quite feasible and can still reduce the total estimated required expenditures significantly.

Table 31. Summary of Potential Reductions in the Required Expenditures for the National Immunization Program for the Next Five Years, US\$

Cost Saving Measure	Approximate Annual Savings
Improving vaccine needs projections and stock management methods	\$300,000-\$860,000
Reducing vaccine wastage	\$84,000-\$148,000
Using plasma-derived HBV vs. recombinant DNA	\$340,000
Using regular disposable syringes (vs. auto-destruct)	\$240,000
Total possible savings per year	\$964,000-\$1,588,000
Average projected annual expenditures required for program with all changes desired by MOH*	\$6,430,000
Projected expenditures with reductions	\$4,842,000-\$5,466,000
Percent reduction in estimated expenditures	15%–25%

* See Table 23 in Section 5.2.

Further reductions in costs of the improved and expanded program over the next five years can be realized by phasing in some of these planned changes, as the next section discusses.

6.2 Phasing in Planned Improvements

Given the large scope of the improvements to the National Immunization Program that the MOH would like to implement, it may be sensible to phase in some of these improvements. Phasing in program changes and innovations not only saves resources in the short term, it also allows the NIP to increase its budget gradually, instead of requesting large increases all at once. In addition, it allows for more careful planning and capacity building, especially at the local level, to ensure that the changes are well implemented and that the program learns from initial mistakes. In particular, it may be logical to phase in the two most ambitious and costly improvements planned by the NIP—the introduction of Hepatitis B vaccine and the upgrading of the cold chain system.

6.2.1 Phasing in the Introduction of Hepatitis B Vaccine

One possible option for introducing Hepatitis B vaccine is to phase it in over a period of three years, beginning the first year with five regions, adding five more regions the second year, and then going to all 16 regions by the third year. As shown in Table 32, this will save the program around \$1.5 million in the first two years.²⁴ While it can be argued that this approach is unfair and can lead to accusations of favoritism to the regions selected first, during this two-year period, the NIP can prepare, field-test and refine its training program for health workers on Hepatitis B immunization,

²⁴ Though these savings would have to be compared to the cost of treating the disease in people living outside of the pilot areas who caught the disease.

field-test, and refine IEC materials related to Hepatitis B, and so forth. It is also essential to improve the monitoring and surveillance of Hepatitis B, as discussed in Section 5.2.5. The improvement of the surveillance system will ensure an ethical phasing in of Hepatitis B namely, by identifying the highest risk areas in the population and starting with them.

Table 32. Projected Cost of Phased vs. Blanket Introduction of Hepatitis B Vaccine in Morocco

Year	Phased Introduction (A)*		Blanket Introduction (B)		Cost Difference (B-A)
	Target Population	Vaccine Cost	Target Population	Vaccine Cost	
1999/2000	209,903	\$603,954	585,627	\$1,685,025	\$1,081,070
2000/2001	419,122	\$1,205,940	584,675	\$1,682,285	\$476,345
2001/2002	583,254	\$1,678,197	583,254	\$1,678,197	\$0
2002/2003	578,693	\$1,665,073	578,693	\$1,665,073	\$0
2003/2004	570,830	\$1,642,449	570,830	\$1,642,449	\$0
TOTAL	\$6,795,613		\$8,353,029		\$1,557,415

* Assumes: five regions in 1999/2000; 10 regions by 2000/2001 and all 16 regions by 2001/2002.
Based on 1998/99 price per vial of \$6.90 for recombinant DNA vaccine.

6.2.2 Options for Upgrading the Cold Chain System

The NIP's ambitious plans to upgrade the aging cold chain system over the next five years—by replacing all refrigerators and other cold chain equipment within five years, equipping all new health facilities, renovating the existing cold rooms, and building four regional cold rooms—will require an estimated \$4.3 million in additional expenditures, as seen in Section 5.2.2. Given this high amount, it may be more realistic to phase in and rationalize these improvements over a greater period of time. Since replacing aging cold chain equipment is the most costly element (75 percent) of upgrading the overall system, the NIP program managers felt that replacing 10 percent of the equipment per year—that is, half within five years—is much more likely to be accepted by the MOH and Ministry of Finance. The NIP identified two reduced options for improving the cold chain infrastructure: Option A calls only for replacing 10 percent of the equipment per year and equipping new facilities. Option B adds to the first option the expansion and renovations of cold rooms desired by the NIP. Table 33 compares the investment capital needed for the NIP's original plans and these two options over the next five years. Compared to the \$4.3 million required for the original NIP plan, Option A requires \$2.3 million in investment dollars and Option B \$2.7 million.

For accurate planning of the finances needed to sustain and replace cold chain equipment without depending on donations, a more thorough analysis of the current status of the cold chain system and future needs should be carried out.

Table 33. Comparison of Investment Capital Required for Different Options for Upgrading the Cold Chain System from 1999/2000 to 2003/2004 (US\$)

Option/Plan	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	Total
NIP's Original Plan*						
20% replacement of cold chain equipment/year	614,898	633,345	652,345	671,916	692,073	3,264,477
Equipment for new facilities	125,921	129,699	133,590	137,597	141,725	668,532
Cold room renovation/construction	92,000	77,250	79,568	81,954	84,413	415,185
Total	\$832,819	\$840,294	\$865,503	\$891,467	\$918,211	\$4,348,294
Option A						
10% replacement of cold chain equipment/year	307,449	316,672	326,173	335,958	346,036	1,632,288
Equipment for new facilities	125,921	129,699	133,590	137,598	141,726	668,534
Total	\$433,370	\$446,371	\$459,763	\$473,556	\$487,762	\$2,300,822
Option B						
Cost of Option A	433,370	446,371	459,763	473,556	487,762	2,300,822
Cold room renovation/construction	92,000	77,250	79,568	81,954	84,413	415,185
Total	\$525,370	\$525,621	\$539,331	\$555,510	\$572,175	2,716,007
Cost savings with Option A	\$399,449	\$393,923	\$405,740	\$417,911	\$430,449	\$2,047,472
Cost savings with Option B	\$307,449	\$314,673	\$326,172	\$335,947	\$346,036	\$1,632,287

* See Table 19 in Section 5.2.2.

6.3 Changing the Mix of Financing and Mobilizing Additional Resources

This section discusses possible ways to change the mix of immunization financing with the goal of mobilizing sufficient resources to pay for the improvements and changes planned by the NIP within the next five years and beyond. The focus of these changes is on mobilizing local resources and decreasing the role of World Bank and donor funding in financing the recurrent costs of the immunization program. The section presents possible scenarios for financing the program with different mixes of funding, based on the objectives of the NIP and the planned health sector reforms.

6.3.1 Increasing Central Government Budget Allocations for the NIP

Health spending in Morocco, as compared to many countries with similar socio-economic levels, is quite low, as discussed in Section 4.1. Health spending of an estimated \$40 per capita per year from all sources, including households, compares to a figure of around \$100 per capita in Tunisia. The percentage of the total government budget going towards health is also low compared to similar countries as well as to some periods in its past. Currently, the MOH budget makes up 4.88 percent of the total government budget, compared to 8.5 percent in Tunisia and 7.4 percent in Morocco in 1966.

As discussed in Section 5, the estimated required expenditures for the NIP, with planned improvements, will be between \$6.2 and \$6.6 million per year for the next five years. The estimated

funding gap is around \$3 million per year for the next two years, and, assuming World Bank loan funds are no longer available to the program after 2000/2001, the gap grows to around \$5 million for the three years after that. The \$5 million funding gap represents only a tiny increase in the overall government budget of around \$7.8 billion in 1997/98 (DH 74,219,181,000) and only 1.3 percent in the overall MOH budget. Filling the \$5 million funding gap would therefore only require increasing the proportion of the government budget going towards the MOH from the current 4.88 percent to 4.94 percent.

The financing scenarios presented in Section 6.3.6 assume that the government will take over the financing of many of the program's recurrent costs with its own funds in order to develop a truly sustainable immunization program for the future. The MOH has, in fact, recently proposed to pay for all vaccines, including Hepatitis B, with government (not World Bank) funds, starting in 1999/2000 and has requested sufficient funding for this. The MOH budget still has to be approved by the Ministry of Finance and other parts of the government and thus this increase is not certain.

6.3.2 Changing the Role of World Bank Funding in Supporting the NIP

As seen in this study, the majority of recurrent, variable, non-personnel expenses of the National Immunization Program are paid with World Bank funds channeled through the MOH investment budget. The use of investment funds to pay the recurrent costs of the program has served as an effective short-term strategy to protect the financing of the program, but it is not a sustainable strategy for the long term. This is all the more true given that the current loan (BAJ1) is ending in two years and a follow-on loan is uncertain at this time.

A more appropriate role for World Bank lending over the next five years would be to provide technical assistance and trainers to support improvements to critical systems required for a strong immunization program, such as disease surveillance, program monitoring and supervision, and routine reporting. The Bank could also assist in the planning and training required for the decentralization of the immunization and other health programs—one of the main health sector reforms that the Bank will be supporting under the upcoming Health Financing and Management Project (see Section 4.1.1.1).

The scenarios below assume that World Bank loan funding for vaccines and other recurrent program costs will end in two years, with the ending of the BAJ1. One scenario shows the government picking up vaccine costs, including Hepatitis B, immediately (in fiscal 1999/2000)—as the MOH as proposed. Another scenario involves weaning the NIP off loan funding over a two-year period, allowing more time for the MOH to seek increasing budgetary and hard currency allocations from the government. The costs associated with the training and technical assistance that this report proposes the Bank could provide are not included in these scenarios.

6.3.3 Expanding Insurance Coverage for Immunizations and Increasing the Role of the Private Sector in Providing Immunization Services

For the last several years, the government has been planning a mandatory health insurance program for all public and formal private sector employees. The goal of this payroll-based scheme—*Assurance Maladie Obligatoire* (AMO)—is to extend health insurance coverage from the current 15 percent of the population to 30 percent. This plan, which will incorporate the CNOPS for government employees, will be paid for by payroll deductions and matching contributions from employers. One of the main goals of the AMO is to reduce the government's burden on hospital budgets, making it

possible over time to reallocate resources from the hospital sector to basic and preventive services. The government has recently stepped up its planning and discussions concerning this program, which it plans to begin implementing in the next two years.

Plans are still being developed and many questions and problems remain to be addressed. While the focus of the AMO has thus far been on curative and hospital care, it is still to be determined if preventive health services, such as immunizations, will be covered. A law has recently been proposed that would require that priority health services, including immunizations and family planning, be included in the AMO coverage. It is not yet known, however, if or when the government will pass this law.

The scenarios below make certain assumptions. They assume most AMO beneficiaries will seek immunization services from government health facilities and that the AMO will contribute each year to the MOH budget to cover the costs of these services or will reimburse the MOH directly for these costs. They also assume that the reimbursement rate to the government for the complete series of immunizations will be 100 percent of the estimated costs of fully immunizing a child in the public sector, as is stated in the plans. With the addition of Hepatitis B vaccine and other new technologies, the estimated cost per FIC will be around \$24.²⁵ They then assume that a portion of the \$25 will go back to the NIP, equivalent to the share of the costs that the NIP pays for. This comes to 37 percent or around \$9.25 per FIC. The MOH would keep the remainder of the reimbursement (\$15.75) to cover other costs.

One of the MOH's goals is to increase the role of the private sector in the provision of immunization services from the current 2-4 percent to 10 percent. In keeping with this goal, the analysis assumes that some of the AMO beneficiaries will seek immunization services in the private sector, and that the AMO will reimburse them for these services. The reimbursement rate assumed will be the same as in the government sector (\$24 for the full series), around one-half of the fees currently charged by private providers. This reimbursement rate of 50 percent matches the current estimated rate that the CNOPS reimburses its beneficiaries for health services obtained in the private sector.

While the government also plans to establish a solidarity fund (*Fond National d'Assurance Maladie, FNAM*) to cover health care costs for the poor, this scheme thus far only covers hospital care and is not yet well developed. It is therefore assumed for the scenarios that immunization services for the poor will continue to be paid out of the state budget for the next five years.

6.3.4 Increasing the Role of Local Governments in Financing Immunization Services

At the present time, local governments contribute to the financing of immunization services mainly in the form of transportation and personnel costs incurred during the NIDs. Most of this contribution comes from sectors other than health, as discussed above. Nearly all of the health sector's funding for the NIP continues to come from the central government.

With the plans for decentralization of the health sector over the next several years (see Section 1.5), it is likely that the 16 proposed regions will assume a greater role in providing and financing

²⁵ This is based on the total estimated cost of the current program of around \$11 million per year, plus \$2 million for HBV and disposable syringes, for a total of \$13 million. This total, divided by the estimated number of children fully immunized per year (Table 9) comes to around \$24/FIC.

immunizations and other preventive care services. The NIP has, in fact, already begun a series of meetings to discuss the implications of decentralization on the program and the potential training and infrastructure requirements to establish a well-functioning decentralized program. While it is likely that the central government will continue to be responsible for the procurement of vaccines, supplies, and equipment; reporting and monitoring of immunization activities; setting overall program goals; and other critical functions best carried out at the central level, some of the activities and functions for which the regions should have greater responsibility include:

- ▲ Planning, implementing, and financing regional-level immunization days and mini-campaigns (to replace or supplement the NIDs);
- ▲ Increasing the frequency and regularity of mobile health team visits to rural, isolated areas;
- ▲ The storage and distribution of vaccines and supplies eventually through the establishment of regional cold rooms. The regions would also assume the distribution of vaccines to provinces currently carried out by the NIP once the regional cold rooms are built.

According to government documents, financing at the local level would come from local taxes and levies, revenue sharing, and grants from the national government.

In the scenarios presented in Section 6.3.6, the regions assume the costs of the construction and maintenance of the four proposed regional cold rooms, beginning in 2000/2001. They also gradually assume the costs of replacing cold chain equipment at 10 percent a year.

6.3.5 The Role of Donors in Supporting the NIP

A number of donors have been decreasing their direct financial support of the NIP and plan to phase it out altogether. This includes USAID, which plans to withdraw its support to the health sector over the next several years under its transition plan. As seen in Section 4.2.2.4, donors are currently financing around 4 percent of total estimated costs of the immunization program and 11 percent of the program-specific costs. This support is mainly for cold chain equipment, IEC activities and materials, Vitamin A supplements, and some transportation costs.

While several of the current funders are reducing their support, a number of new donors will likely provide support to the program in the future, including the governments of Canada, Japan, Switzerland, and Luxembourg, as well as the European Union through its MEDA Project.²⁶ Given this, the future financing scenarios assume about the same level of funding for recurrent variable costs, as is currently the case.²⁷ Donor funding in these scenarios will continue to cover the costs of IEC and short-term training for the next five years, and Vitamin A supplements for the next two years, with the government picking up this cost thereafter.

In addition, donors will likely provide technical assistance and training to improve critical support systems, including the disease surveillance, monitoring, and reporting systems and the cold chain infrastructure. This includes financing a study of the current cold chain system to determine future needs and develop a detailed plan for upgrading the system. These technical assistance and

²⁶ This project is intended to help establish a free trade zone among the Mediterranean countries.

²⁷ Donations for cold chain equipment are not included, as it is assumed that the government (central and regional levels) will pick up the costs of upgrading the cold chain system.

training costs contributed by donors are over and above the costs estimated in this analysis to improve these systems, and thus are not included in the scenarios below.

6.3.6 Possible Scenarios for the Long-term Sustainable Financing of the NIP

This section presents various possible scenarios regarding changes in the mix of financing sources for immunizations in Morocco, including the mobilization of new resources through the expanded and reformed insurance plans and through local governments, as part of the regionalization process. These scenarios are presented to demonstrate the potential for changing the mix of financing and for tapping into other financing sources. They are illustrative only, and are based on assumptions that would have been refined based on further information and analysis. The results should therefore be interpreted with caution.

The scenarios are based on the recurrent variable, non-personnel costs of the program (see Section 5.1) and the additional expenditures that will be required to implement the planned improvements and changes, including the introduction of Hepatitis B vaccine, upgrading of the cold chain system, and the other improvements discussed in Section 5.2. It is assumed that these improvements will be made within the next five years. However, it is also assumed for the scenarios that the NIP will phase in several of the desired improvements, chose some lower cost options for new technologies, and reduce costs by introducing some of the cost saving measures discussed in Section 6.1. More specifically, the scenarios assume the following:

- ▲ Full introduction of Hepatitis B vaccine, beginning in fiscal 1999/2000;
- ▲ Introduction of the regular disposable syringes beginning in fiscal 2000/2001, to allow time for the NIP to convince the MOH to adopt this technology and request the additional funds required;
- ▲ Upgrading the cold chain system, according to Option B, which involves renovating the existing central cold rooms in Casablanca and Rabat, replacing refrigerators and other cold chain equipment 10 percent per year over the next five years, equipping any new health facilities with cold chain equipment, and building one regional cold room per year from FY 2000/2001 to 2003/04, for a total of four regional cold rooms;
- ▲ Continuing the NIDs as they currently are implemented and assuming that other government sectors will continue to contribute personnel, transportation and other costs;
- ▲ Achieving cost savings of around \$350,000 in the first year, which increases 10 percent each year thereafter, by reducing buffer stocks; changing to the population-based method of determining vaccine needs, based on actual wastage rates; and perhaps by reducing vaccine wastage;
- ▲ Using only one-half of the required expenditures for upgrading the surveillance, monitoring and report systems in the first year, since time will be needed to develop a solid plan with the Epidemiology Division. After that, the assumption is that all of the required costs will be met.

Further cost savings can be achieved, as shown in Sections 6.1 and 6.2, if the government chooses the plasma-derived HBV and/or phased in the introduction of the vaccine by region. However, the MOH and the Scientific and Technical Immunization Committee have expressed their interest in using the recombinant DNA vaccine and in introducing it nationwide all at once, to avoid creating inequities between regions. The funding required for the next five years, based on the above assumptions, is shown in Table 34.

Table 34. Assumed Financing Requirements for the Financing Scenarios, 1999/2000-2003/2004 (US\$)

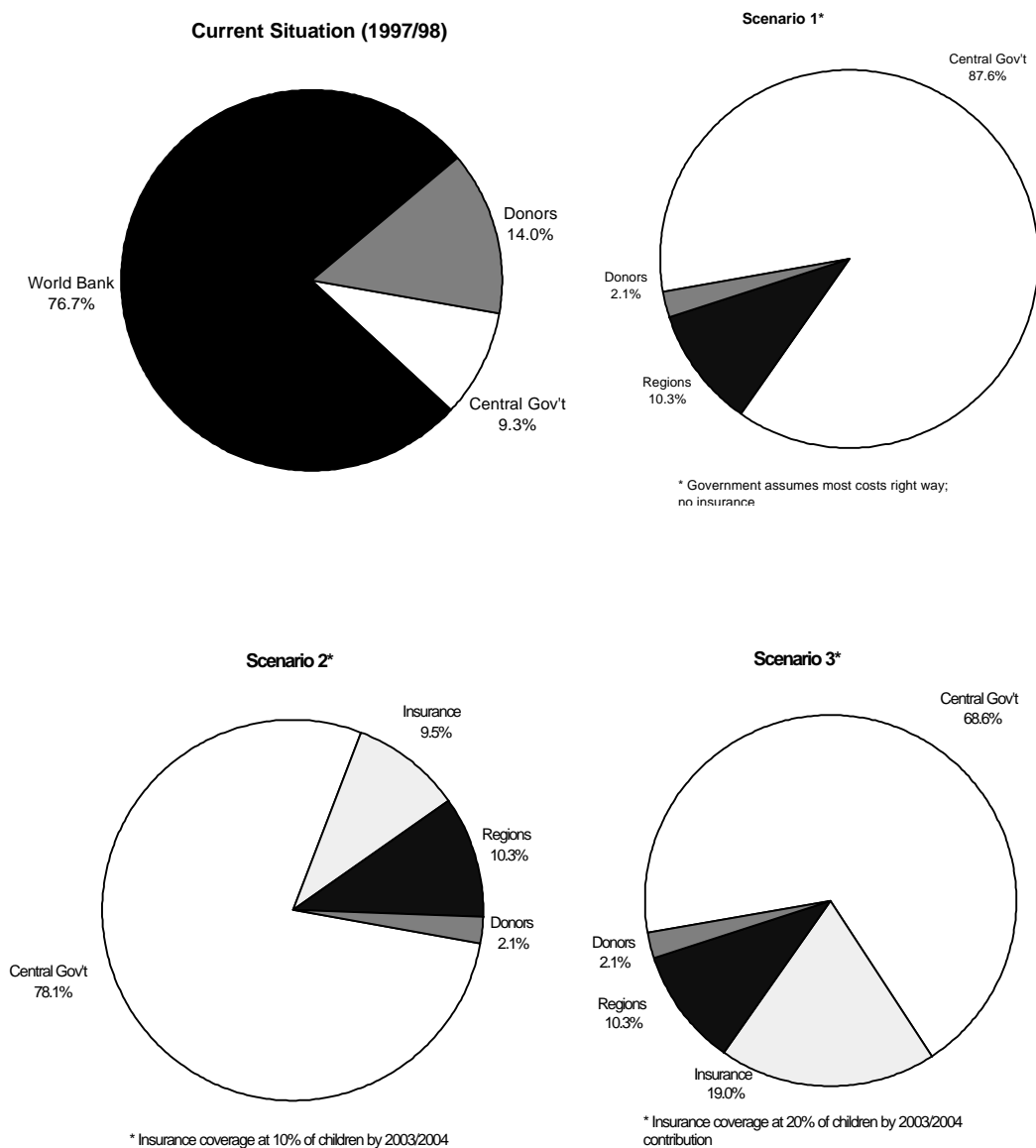
Improvement/ Addition	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	Total
"Basic" Program	2,978,251	3,067,598	3,159,626	3,254,415	3,352,047	\$15,811,937
Hepatitis B Vaccine (full introduction)	1,685,025	1,682,285	1,678,197	1,665,073	1,642,449	\$8,353,029
Cold Chain System Improvements: Option B (see Table 33)	525,370	523,621	539,331	555,510	572,175	\$2,716,007
Additional Cost of Regular Disposable Syringes	0	319,552	320,741	320,506	318,783	\$1,279,582
Surveillance/Reporting System Improvements	\$82,895	\$162,632	\$167,511	\$172,536	\$177,712	\$763,286
TOTAL	\$5,271,541	\$5,755,688	\$5,865,406	\$5,968,040	\$6,063,166	\$28,923,841
Potential Cost Savings	350,000	385,000	423,500	465,850	512,435	\$2,136,785
TOTAL ADJUSTED COSTS	\$4,921,541	\$5,370,688	\$5,441,906	\$5,502,190	\$5,550,731	\$26,787,056
Remaining Funding Gap	\$1,898,783	\$2,045,654	\$4,487,681	\$4,263,311	\$3,993,055	\$16,988,484

In terms of financing, the scenarios also assume the following:

- ▲ World Bank funding for recurrent variable costs will end in two years (2000/2001) with the ending of the BAJ1. The World Bank may provide technical assistance and training for systems improvements, as discussed above, but these costs are not included in the scenarios.
- ▲ Donor funding continues at about the same level as currently, except for equipment, for which the government (central and regional levels) will begin paying. Donors will continue to fund IEC and short-term training costs for the next five years, as well as Vitamin A supplements for the next two years. The assumption is that the government will assume the costs of the supplements after that. A 3 percent inflation factor per year is applied to the donor contributions.
- ▲ Regional governments will gradually pick up the costs of cold chain improvements beginning in fiscal 2000/2001, including the regional cold rooms, the 10 percent replacement of refrigerators and other equipment, and the equipping of new facilities. All scenarios assume the regions will pay for one-third of these costs in 2000/2001, two-thirds by the next year, and 100 percent after that. The central government will assume the costs of renovating the central cold rooms, as well as the remainder of the costs not picked up by the regional governments.

The results of these scenarios are shown in Tables F4–F6 (Annex F) and in Figure 18 for the year 2003/2004.

Figure 18. Mix in Financing of the National Immunization Program in 2003/2004 According to Different Scenarios



6.3.6.1 Scenario 1: Immediate Assumption by the Government of Most Recurrent Expenditures and Little Mobilization from New Sources

In Scenario 1, the central government starts paying for all of the expenditures currently funded by the World Bank loan—vaccines, supplies, some transportation costs, etc.—through increased budget allocations. Donors continue paying for expenditures they currently cover, except for the upgrading of the cold chain system, which the central government pays for entirely the first year and the regional governments gradually contribute to beginning in FY 2000/2001. It is assumed in this scenario that the new expanded insurance program (AMO) will not contribute at all to the NIP program.

As shown in Table F4, under Scenario 1, the government must pay around \$4.8 million per year to cover the program's expenditures. By the year 2003/04, government funding represents 88 percent of total program expenditures, as shown in Figure 17. This is in contrast to the current financing situation also shown in the figure, in which the World Bank loan is financing 77 percent of these costs and the government only around 9 percent.

6.3.6.2 Scenario 2: More Gradual Withdrawal of World Bank Funding and Insurance Coverage to 10% of Children by 2003/04

Scenario 2 assumes that World Bank loan funds will continue to cover the costs they currently cover, including vaccines and supplies for the first two years. For the introduction of Hepatitis B vaccine, it is assumed that the loan will cover the full costs in 1999/2000 and one-half of the cost in the following year, with the government budget allocations covering the other half. The Bank loan will also cover the cost of disposable syringes for the first year they are introduced (2000/2001).

The reformed and expanded insurance program—AMO—also figures into this scenario, beginning in 2001/2002. The assumption is that the insurance program will pay the MOH for immunizing 5 percent of children under one year, and 10 percent of children by the following year at a reimbursement rate of \$9.25 per child, based on the estimated cost/FIC and portion of these costs paid by the NIP.

Under this scenario, the increase in the government's budget allocations starts off slowly—\$568,000 in 1999/2000 (vs. \$4.8 million under the first scenario)—growing to \$1.3 million the following year and jumping to \$4.8 million in 2001/2002, after the World Bank (BAJ1) loan ends. However, the insurance program begins to pick up some of the program costs in that year, in the amount of around \$270,000 when coverage of 5 percent of targeted children is assumed, and to around \$500,000 when coverage increases to 10 percent of children. By the year 2003/04, insurance will cover nearly 10 percent of total required funding and the government budget will contribute 78 percent—down from 88 percent under the first scenario.

6.3.6.3 Scenario 3: Greater Role of Insurance in Covering Program Costs

Scenario 3 takes the assumptions of Scenario 2, including the continual role of World Bank funding for the first two years, but increases the role that insurance plays in financing the program, beginning in 2002/2003. The assumption is that insurance will pay for the costs of immunizing 10 percent of children under one year in 2001/2002, 15 percent of children the following year, and 20 percent of children thereafter. If this can happen, the estimated share of program costs paid by insurance will increase more than \$1 million by 2003/2004, or 19 percent of required funding by the

year 2003/2004, as shown in Figure 17. The share covered by government budget allocations will decrease to around 68 percent by that year.

7. Summary, Conclusions, Lessons Learned and Recommendations

7.1 Summary of the Main Findings

Costs:

- ▲ The estimated overall total annual costs of Morocco's NIP is around \$11.2 million. This is the equivalent of around US\$ 0.77 per dose, \$21 per fully immunized child under one year, and \$0.40 per capita. Sixty percent of these annual costs—or around \$6.7 million—are personnel costs, mainly the value of the time health workers devote to providing and managing immunization services. Vaccines account for 20 percent of total costs, capital costs (building space, equipment, vehicles, etc.) account for another 11.5 percent and transportation costs around 5 percent.
- ▲ The National Immunization Days (NIDs) make up almost one-third (32 percent) of the total estimated cost of the program—around \$3.5 million per year.
- ▲ The improvements to the program planned by the MOH for the next five years will more than double the required annual funding the MOH must find for the program—from around \$3 million to more than \$6 million per year. These improvements cover several areas, including the introduction of the Hepatitis B vaccine nation wide, replacement of cold chain equipment, management information systems (MIS), supervision and reporting systems.

Financing:

- ▲ In terms of the overall Ministry of Health budget, the total costs of the NIP channeled through the MOH accounted for around 2.6 percent of the total MOH budget in 1997/98. Recurrent, variable non-personnel costs of the immunization program accounted for 3.6 percent of the MOH capital budget, through which most of these costs are funded.
- ▲ The NIP program is primarily dependent on external funding and, as such, is vulnerable to any changes in the financing of the program. For instance, the government paid an estimated \$8.1 million or around 73 percent of the total estimated costs of the entire program for 1997/1998. The bulk of the total resources designated specifically for immunization activities (72 percent) has been financed by external resources, in the form of the World Bank loan (61 percent) and donor contributions (11 percent), including three main components of the NIP: vaccines, cold chain equipment, and supplies. External resources also account for 68 percent of the program-specific costs requiring purchases in hard currency. The routine immunization program is particularly dependent on external resources (estimated 90 percent).
- ▲ Due to Morocco's participation in the Vaccine Independence Initiative, the government has been able to purchase high-quality, relatively low-cost vaccines since 1994. If the NIP improves the way it determines vaccine needs and manages stock, the current capitalization of \$1.1 million is more than adequate to meet the program's current estimated needs of \$1.3

million per year for the traditional Expanded Program on Immunization (EPI) antigens. However, the addition of Hepatitis B vaccine to the children's immunization schedule will require additional capitalization of the revolving fund.

Funding of Immunizations in the Future:

- ▲ Funding for the NIP will have to increase substantially beginning in the year 2000, if the government is to implement the planned changes and improvements. The gap between required funding and projected funding available through the government will be around \$3 million for the next two years (fiscal years 1999/2000 and 2000/2001). Assuming that World Bank loan funding will not be available to the program after the current loan ends in fiscal year 2000/2001, this funding gap will grow to \$4 million or more per year.
- ▲ Three scenarios for financing the immunization program, including the additional sums needed for the planned improvements over the next five years, are presented in this analysis. The scenarios show the potential for mobilizing new internal resources from local or provincial governments, as well as from the planned mandatory payroll-based insurance (AMO), if a proposed law requiring coverage of immunizations and other preventive health services is passed.

7.2 Important Progress of the NIP in Morocco

- ▲ The government of Morocco has achieved impressive gains in immunization coverage in the last decade; thanks to use of the World Bank loan to pay many of the recurrent variable costs of the program, which has helped the MOH protect funding for immunization services, as well as the use of national immunization days (NIDs) as a major means of boosting immunization coverage quickly. The progress specifically includes the following:
- ▲ The coverage rate of the population is averaging greater than 85%.
- ▲ The incidence and prevalence rates of vaccine preventable diseases have declined considerably.
- ▲ The polio eradication campaign has progressed and is moving towards complete eradication in the near future.
- ▲ The NIP is considered a high priority for the MOH and the government as a whole. For this reason, it has benefited in terms of resources and social mobilization.
- ▲ Due to the VII mechanism and the World Bank loans, procurement of vaccines has been reliable, reasonably priced and funded without any delays or major difficulties.

However, progress has been limited due to some difficulties which should be mentioned:

- ▲ The disparity between rural and urban areas as well as socio-economic groups remains significant,
- ▲ The range of vaccines available and quality of services accessible remain disparate according to income levels and not according to public health priorities and needs,

- ▲ The National Immunization Days play a critical role especially in rural areas in terms of vaccination coverage in general and for the campaigns against polio and tetanus in particular.
- ▲ The financing of vaccinations is largely dependent on external support: World Bank loans for vaccines and other supplies, donations for the cold chain and other equipment,
- ▲ The epidemiological surveillance network and information system is not completely reliable and requires strengthening.
- ▲ The National Immunization Program has not been proactive in addressing the issues raised by health system reform and the planned change to the social security system.
- ▲ The future of the program should be clarified in terms of needs, priorities, resources to mobilize, assessment criteria and management mechanisms.

In conclusion: Despite the numerous improvements and impressive progress, the vaccination program in Morocco remains fragile. A sustainable NIP requires:

- ▲ A long-term plan which links needs, objectives, resources, implementation and evaluation mechanisms.
- ▲ Strong inter-agency coordination,
- ▲ Increasing vaccination coverage rates with a reduction in regional and social disparities.
- ▲ Funding based on mobilization of local resources; external resources having an auxiliary role and of specific and decreasing support.
- ▲ An epidemiological surveillance system that is complete and effective.

7.3 Recommendations

7.3.1 Develop a National Immunization Strategic Plan for the Next 10 Years

Three reasons motivate this need:

- ▲ *Renewing the cold chain is of primary importance.* It is a rather large investment, which requires strategic choices on the sites of cold rooms, equipment type, positions necessary, and resources to mobilize for capital and operating costs.
- ▲ *Adoption, introduction and application of new vaccines to the NIP.* In the next 10 years, numerous vaccines will be put on the market such as new, improved and combined products. The question of how to proceed with these new vaccines has already been raised with HepB and Hib and soon will need to be addressed with combined vaccines, rotavirus, etc. This question is often raised in relation to new vaccination technologies and the safety of injections.

- ▲ *Profound changes in the institutional and financial environment.* These changes will take various forms and have considerable effects in the coming years: decentralization and regionalization, installation of health insurance for employees and medical assistance fund for the indigenous population, growth of the private sector including which, will include the rural and semi-urban zones, integration of health services, and the new role of the central administration.

7.3.2 Continuation of the Internalization Effort for Financing of Vaccinations

In less than 10 years, Morocco has passed from an immunization financing system based on donations from bilateral and multilateral organizations to a mixed financing strategy strongly supported by the State. Public financing represents more than 80% of the total program costs. Morocco is no longer dependent on donations and external support without national matching funds. It assumes the financing of vaccinations with its public resources and by mobilizing loans of development banks while guaranteeing reimbursement. This is an important step in planning sustainable financing for the beginning of the next decade.

Three conditions for this:

- ▲ Management of invoices of vaccine, supplies and other recurrent vaccination expenses in the public sector by the State alone or with health insurance organizations and within the context of the operating budget,
- ▲ Maintain vaccine and supply procurement mechanisms based on the principles of international bids and research on the best cost-quality ratio
- ▲ Use of external financial contributions as supplements and complements to the national public effort to create investments, start a new program or invest in human resources.

7.3.3 Change the Evaluation System of Needs, the Management of Resources and Activities and the Collection of Information

The National Immunization Program continues to function principally as a vertical program in which, the information, resources and evaluations are centralized. This should be considered when addressing the following:

- ▲ The evolution of needs for the different population groups (children, women, at risk groups),
- ▲ The national objectives (to reduce regional and social disparities in the access to vaccinations),
- ▲ The tendencies to integrate services, activities and health program
- ▲ The decentralization of responsibilities, resources, and evaluation of results.

The NIP as a centralized program was justified and considerable progress was made until recently. This progress combined with the new quantitative and qualitative objectives for vaccination coverage requires a new organization of the vaccination program.

In this new organization, the current management of activities and resources would largely be devolved to the areas and the provinces. The national immunization days would be for example, smaller, localized and very targeted campaigns rather than activities proceeding everywhere, at the same time and using the same type of intervention.

A central unit responsible for vaccinations will be maintained with new responsibilities more centered on:

- ▲ Setting strategic objectives and determining new approaches,
- ▲ Developing tools for management, reporting and evaluation,
- ▲ Dialogue with other divisions involved in preventive health, epidemiology and primary health care,
- ▲ Planning for procurement of vaccines and supplies,
- ▲ Consideration on questions of financing and coordination
- ▲ The collection, analysis and feedback of information to regions and provinces,
- ▲ The evaluation of objectives, resources and performances.
- ▲ The evolution of the NIP in terms of resources, competence and means adapted to its new role is thus essential and partially determines the expected changes.

7.4 Recommendations

7.4.1 Applied Research

- ▲ *In close collaboration with the provinces, conduct an inventory of equipment and conduct a study of the cold chain* by updating prior studies seriously bringing to date the studies previously conducted. The three most important questions are: What is the current state of the cold chain? What are the needs for the next ten years? How can a system for managing and monitoring the cold chain be established which, contributes to timely decision making?
- ▲ *Performances in coverage rates and regional and social differences:* Morocco has attained elevated coverage rates if one considers rates at the national level. However, there are significant disparities among different provinces and population groups. An in-depth study of the contributing factors would be useful in orienting targeted efforts to reduce the disparities in coverage rates observed.
- ▲ *Measles eradication:* This objective is ambitious but it merits attention at the present moment to prepare and maintain actions aimed at eradicating measles in the next few years. A cost-effectiveness study on the burden of morbidity is envisioned to determine the priorities and most effective actions in terms of public health. A strategic plan should be developed in coordination with the agencies concerned.

- ▲ *Implication of the private medical sector in immunization services:* Identify the present obstacles, conditions for integration, the legislation to be envisaged, initiatives to promote, objectives and realistic stages to involve the various parts of the private sector while respecting national recommendations.
- ▲ *Safety of Injections:* Regularly study the current injection methods utilized in the different health services (private/public, urban/rural, EPI vaccines/Non EPI) and identify the practices, norms and products to promote.
- ▲ *Conduct a study on cost recovery* and on the effects of cost sharing by users and their families of vaccination cards, syringes and other products or possible services in the public sector. A better understanding of the receipts generated from their use and the effects on access and quality of services would be useful in making appropriate decisions in this area

7.4.2 Program Planning, Management and Evaluation

The NIP in the Direction of the population is often absorbed by the routine tasks of practical management of program activities. This creates problems for the routine activities of planning, coordination and evaluation. Three practical recommendations are:

- ▲ To reinforce the policy of detailed annual immunization plans, which would include, precise quantifiable objectives, resources to be mobilized by province, performance objectives and financing which can be mobilized.
- ▲ To assist provinces in the development of provisions based on rigorous methods and not founded only on historical data. To take into account in a systematic manner the strategies adapted to the wastage rates of the effective stocks and not on the fictitious norms or standards.
- ▲ To organize regular work sessions with the Direction of Epidemiology, Planning and Financial Resources and Department of Procurement of the Ministry of Health to prepare the schedule and vaccination program activities.

7.4.3 Vaccine Procurement and Supply

The NIP ensures part of the functions of vaccine and supply procurement and purchase. It deals with the reception and distribution of the vaccines and other products utilized for the NIP activities. Development is necessary in order to profit from the experience accumulated by UNICEF/Rabat in terms of following-up on the markets and allowing the Division of Procurement and Distribution to ensure the essential functions currently assumed by the NIP.

In practice this may signify:

- ▲ Establishing a national authority for the control of biological products and vaccines to insure respect for international and national quality standards,
- ▲ Strengthening the capacities of the Minister of Health in terms of procurement on the international and local market of vaccines and supplies,

- ▲ Benefiting from the experience acquired by UNICEF through the VII,
- ▲ Improving and revising the method of determining vaccine needs taking into account several factors (target population, actual wastage rates by antigen, actual stock levels.)
- ▲ Gradually transferring the responsibilities of procurement and distribution to the Minister of Health's division of procurement based on a workplan, effective procedures and acceptance by all;
- ▲ The terms established for the year 2001 would be reasonable if a transfer plan is established by the end of 1999.

7.4.4 Cost Analyses and Decision Making

The NIP is at a crossroad and many decisions must be made in order to manage the development and reinforcement of the program (renewal of the cold chain, reinforcement of NIDs at the local level, introduction and application of disposable syringes, completion of the polio eradication effort, plan for measles eradication, strategy to reduce the coverage disparities between regions). All of these decisions have an important cost as seen in this study. It would be useful to systematically introduce the dimension of costs in order to better understand the problem and generate effective decisions.

It would be useful to take into account the process of decentralization within this context:

- ▲ To complete this study with a cost analysis at the province level which is representative of the different situations in Morocco. (ie the protocol proposed by PHR for a study in the provinces),
- ▲ To systematically collect data on costs from documents and during the coverage or evaluation studies.
- ▲ To train NIP staff in cost analyses and management of vaccination activities.
- ▲ To systematically take into account data on costs and efficiency when determining priorities and resource allocation.

7.4.5 Financing

The objective is to improve the level of financing of local resources in order to make better use of external resources. (loans and donations):

- ▲ To respect the separation between the operating budget and the capital budget: to shift in 2000-2001 the NIP components in the budget or the separate account. To maintain the advantages which the NIP enjoys because of its priority status.
- ▲ Significantly increase amounts in local resources in the budget of the Ministry of health for current expenditures which are not covered or not sufficiently covered by foreign donations (IEC, training, cold chain, monitoring).

- ▲ To envisage complete financing for all of the vaccines in the NIP as well as injection material through local resources for the financial year 2001-2002, including hepatitis B in the year 2000-2001
- ▲ Develop and reinforce a budgetary line item for vaccines taking into account the introduction of new vaccines (such as hepatitis B) and maintaining the purchase by means of UNICEF during the first years while exploring possibilities on the international market.
- ▲ Create a NIP assistance fund that would assemble all external contributions and donations for immunizations. The objective of the fund would be to allocate resources for immunizations in an integrated fashion according to the priorities defined by Morocco's health authorities. This fund would avert short-term allocations made without consideration for the long term and clarify and simplify the national immunization effort.
- ▲ Assist in the establishment of health insurance systems which will be responsible for vaccination services on a contractual basis for the public sector and according to tariffs' regulated in the private sector. The progressive coverage plan of the population by the health insurance must be accompanied under the assumption of an increasing responsibility of immunization financing.
- ▲ Encourage the private sector to offer quality vaccination services: develop several initiatives to increase availability in particular to the underprivileged zones. A clear and flexible framework should be developed in coordination with the partners concerned.
- ▲ With progress in decentralization, integrate local communities (provinces) in the planning and financing of services and vaccination activities: taking responsibility for the poor, for financing NIDs, and for investments for the cold chain.

Annex A. Data on Reported Cases of EPI Target Diseases in Morocco, 1987–1997

Table A1. Number (and incidence per 100,000 people) of Reported Cases of EPI Target Diseases, 1987–1997*

Disease	1987	1990	1992	1993	1994	1995	1996	1997
Measles	26,621	1,577 (6.2)	6,008 (23.5)	8,431 (32.3)	3,512 (13.5)	2,505 (9.4)	1,324 (4.8)	2,574 (9.4)
Tetanus (total)	189	81 (0.4)	73 (0.3)	49 (0.15)	27 (0.08)	35 (0.13)	29 (0.11)	24 (0.09)
Neonatal Tetanus	147	28	23	9	9	14	14	4
Pertussis	1,078	83 (0.3)	45 (0.14)	73 (0.28)	132 (0.51)	37 (0.14)	50 (0.18)	49 (0.18)
Diphtheria	7	0	1 (0.004)	0	0	0	0	0
Polio	9	0	0	0	0	0	0	0
Tuberculosis	27,159	26,010 (103.0)	27,409 (107.2)	27,606 (105.8)	30,316 (116.2)	29,829 (111.7)	31,771 (116.1)	30,227 (110.7)

Source: Epidemiology Department, MOH

* Numbers of reported cases are those given by the Epidemiology Department. Incidence rates per 100,000 population were calculated.

Annex B. National Vaccination Schedule for Morocco

Table B1. National Vaccination Schedule (Public and Private Sectors)*

Age of Child	Vaccines
At birth	BCG + OPV (zero) + HBV1
2 months	DPT1 + OPV1 + HBV2 + Hib1
3 months	DPT2 + OPV2 + Hib2
4 months	DPT3 + OPV3 + Hib3
12 months	Measles + HBV3
18 months	DPT4 + OPV4
5 years	MMR + DPT5
Every 10 years	DT + OPV

* Not applicable to public sector

Table B2. Vaccination Schedule for Children Less than 1 Year of Age (Public Sector)

Age of Child	Vaccines
At birth	BCG, OPV 0
6 weeks	DPT 1, OPV 1
10 weeks	DPT 2, OPV 2
14 weeks	DPT 3, OPV 3
9 months	Measles

Table B3. TT Vaccination Schedule for Women of Child-bearing Age

Dose	Immunization dates and intervals
TT 1	As soon as possible in child-bearing age, or the soonest possible during pregnancy
TT 2	At least 4 weeks after TT1
TT 3	At least 6 months after TT2
TT 4	At least 4 weeks after TT3 or soon during next pregnancy
TT 5	At least 1 year after TT4 or soon during next pregnancy

Annex C. Detailed Methodology for Estimating Total Annual Costs of the Routine Immunization Program

The current costs of the routine program consist of both the recurrent costs and capital costs. Estimated costs for FY'97/98 were used as the basis for determining current costs.

Recurrent Costs

The recurrent costs of the NIP program include the cost of vaccines, personnel, transport costs such as fuel and vehicle maintenance, supplies, short-term training of health personnel related to immunizations, social mobilization activities, and maintenance and overhead. Below is a brief description of how each of these costs was estimated.

Vaccine cost estimates are based on the actual number of doses delivered in 1997 through routine program channels, and the vaccine prices for 1997/98 were obtained through the Vaccine Independence Initiative. They include shipping, handling, and a 10 percent buffer for loss and breakage (Table C1). This method most closely reflects the true cost of vaccines, since it represents the amount of vaccine actually consumed, whether by recipients or by wastage. However, it is important to remember that this estimate is based on actual usage, not purchases of vaccines.²⁸ The total estimated cost of vaccines for the routine program in 1997/98 was \$1,287,163.

Table C1. Annual Vaccine Cost Estimates, Routine Program, 1997/98

Vaccine	Routine Doses Delivered	Doses per Vial	Wastage Coefficient	Vials Used	1997-98 Price per Vial (US\$)	Total Cost (US\$)
BCG	505,790	20	3.85	97,365	1.63	158,704
DPT	1,398,183	10	1.39	205,533	1.03	200,178
OPV	2,271,511	10	1.1	254,409	1.12	279,850
Measles	1,288,936	10	2.5	329,968	1.64	528,464
TT	1,358,328	10	1.28	175,224	0.69	119,968
TOTAL						\$1,287,164

Source: NIP staff.

²⁸ As explained in Section 6.1.1, more vaccines are bought each year than are consumed, with the difference at least partly accounted for by stock surpluses. Therefore, basing vaccine costs on usage rather than on amount purchases gives a more inaccurate estimate of the true vaccine costs.

The estimate of personnel costs (Table C2) is based on approximations of the amount of time that health staff spend on immunization activities, made by NIP central-level managers, province-level NIP coordinators, and a few health staff themselves during interviews for this case study. The doctors posted at the primary health care level who are involved with immunization activities were estimated to spend 2 percent of their total time on immunizations, mainly for supervision of nurses. The MCH nurses who actually deliver vaccinations were estimated to spend 20 percent of their total time on immunization activities, as were the aides at the primary health care level. Also included are the province-level NIP coordinators, who spend 100 percent of their time on NIP activities. Central-level staff time, including NIP program staff and management of the MCH Division (under which the NIP falls), is also included. Salary information from 1997 was obtained from the MOH Division of Planning and Financial Resources, as salaries are paid from the general health budget. Salaries for government employees are reported not to have changed for the past three years (since 1994), and salary increases are not planned for the near future. Personnel costs include both regular salaries and additional compensations for immunization-related travel, rural postings, etc., which are less than 0.01 percent of the total personnel costs. The total estimated costs of personnel per year are around DH46 million or US\$4.5 million.

Table C2. Personnel Cost Estimates for the Routine Program, 1997/98

Type of Staff	Number of Staff	% Time Spent on Immunizations	Monthly Salary (DH)	Annual Salary (DH)
Doctors	366	2	11,784	1,035,122
MCH nurses	2,220	20	3,869	20,611,794
Nurses aides	3,149	20	2,578	19,483,266
NIP coordinators	72	100	5,149	4,448,710
MCH division administrator	1	15	13,768	24,783
EPI administrator	1	100	13,768	165,217
EPI administrator	1	100	10,047	120,560
MCH division accountant	1	15	10,047	18,048
NIP accountant	1	100	10,047	120,560
NIP secretaries	2	100	2,143	51,434
TOTAL (DH)				46,079,530
TOTAL (US\$)				\$4,750,467

Source: NIP staff; MOH Division of planning and financial resources

Recurrent transportation costs include the cost of fuel and maintenance of vehicles used for immunization activities. Complete information was not available, since the relevant information is not routinely reported by the various MOH activities. To make an estimate would require manually tabulating individual requisitions for the use of government vehicles at the provincial and prefecture level over the past and then allocating these requisitions to immunization activities, which was beyond the data collection scope of this study. Instead, it has included the routine line item for fuel from the NIP budget, as well as the costs of transporting vaccines from the port to the central cold room in Casablanca, and from central cold room to the provinces. The estimated total annual transportation costs for the routine program obtained using this method are \$26,438.

The supplies category includes items such as needles, syringes, IEC materials, parts for sterilization and cold chain equipment, vaccination cards, registers, and ice packs. Data were obtained from the NIP budgets for 1995-97/98. Annual cost estimations were made based on average purchases made over the past three years and the 1997 unit prices provided by NIP. The estimated total cost per year is \$91,669.

Short-term training includes periodic refresher training for health personnel related to immunization service delivery. Interviews with NIP managers and review of the budgets showed that training does not take place every year, but only when a new aspect is added to the program; in such cases the training is usually arranged and provided by a donor organization. An estimate of short-term training costs was based on past patterns and cost levels shown in the NIP budgets.

Maintenance and overhead includes maintenance of the cold chain equipment, which is estimated at 2 percent of the annualized costs of major cold chain equipment (freezers and refrigerators only, not vaccine carriers, etc.), and an 8 percent allocation of the annual electricity, water, and communications expenditures made by the MOH at primary care facilities. Except for the cold chain data, information on overhead was extracted from the actual expenditures recorded in the MOH budgets. The total estimated cost comes to \$181,172 per year.

Capital Costs

Capital costs of the immunization program consist of the cost of the space in health facilities allocated for immunization services; the cost of cold chain equipment, including cold rooms, refrigerators and freezers; the cost of vehicles used for immunization activities; and the cost of long-term training. Each of these are explained below.

Table C3 shows the annualized cost of building space allocated for immunization services. These costs are based on a price derived from the 1996/97 actual expenditures in the MOH budget for the construction of all new facilities where immunization activities take place, namely rural dispensaries, rural health centers, urban health centers, and rural and local hospitals. The recommended minimum size (in square meters) of primary health care facilities, by location, was obtained from the MOH's 1997 *Report on the Supply of Medical Care (Repertoire de l'Offre de Soins)*, and used to calculate the approximate price per square meter. Input from NIP managers was used to derive parameters for the allocation of facility space to immunization activities for each type of facility. A discount rate of 5 percent was used. The total annualized cost of building space for immunizations is estimated at \$935,647.

Table C3. Annualized Cost of Building Space Allocated to Immunization Services, 1997/98

Type of Facility	Rural Dispensary	Health Center, without labor and Delivery Services	Health Center, with Labor and Delivery	Rural Hospital	Local Hospital	Urban Health Center
No. of units	614	664	132	6	34	530
Avg. area, sq.m.	500	1,000	1,200	5,000	5,000	1,000
% area for immunization services	20	15	10	2	1	15
Total immunization area, sq.m	61,400	99,600	15,840	600	1,700	79,500
Price per sq.m. (DH)	380	380	380	800	1,000	550
Price per sq.m (US\$)	39.18	39.18	39.18	82.4	103.0	56.70
Cost of immunization service area (US\$)	2,405,361	3,901,856	620,536	49,485	175,257	4,507,732
Useful life	20	20	20	20	20	20
Annual cost (US\$)	\$193,012	\$313,095	\$49,793	\$3,971	\$14,063	\$361,712
TOTAL						\$935,647

Source: NIP, MOH Division of Planning and Financial Resources

Equipment costs include sterilizers for needles and syringes, as well as cold chain equipment. Cold chain equipment consists of the central cold rooms, major equipment such as different types of refrigerators and freezers, and small cold chain equipment, such as cold boxes and vaccine carriers. Estimating the annualized costs of cold chain posed some challenges. Since most of the cold chain equipment is more than 10 years old, using the current value of all the equipment would have led to gross overestimates of the annual cost of the cold chain. To avoid this, the estimate considers only equipment that is less than five years old and uses the original purchase prices (1991 UNICEF prices). Data on the equipment types, numbers, and age were obtained from the 1996 cold chain inventory conducted by the NIP program. This inventory identified that, depending on the type of equipment, anywhere from 25 percent to 65 percent of total units were more than 10 years old, and an additional 25 percent to 50 percent were between 5 and 10 years old. A large proportion of the gas/electric refrigerators in particular were more than 10 years old. Although this inventory was acknowledged by the NIP managers to provide inadequate information for comprehensive planning and cost estimation purposes, it was used for these cost estimates because of a lack of any other existing information on the cold chain.²⁹ This lack of in-depth or accurate knowledge about the current status of the cold chain at the central level is primarily due to the fact that most of the cold chain equipment has been donated by external funders. The estimates of major cold chain equipment are shown in Table C4 and those for sterilization equipment and small cold chain equipment are shown in Table C5. The total estimated annualized cost of equipment, both major and minor, comes to \$289,313 (\$101,744 + \$187,569).

Table C4. Annualized Cost Estimates for Major Cold Chain Equipment for 1997-98

Type of Equipment	No. < 5 yrs old	Purchase Price (US\$)	Total Value (US\$)	Useful Life, Years	Annualized Cost (US\$)*
Large refrigerators (<i>armoires frigorifiques</i>)	21	1,429	30,009	5	\$6,931
Freezers	69	1,199	82,731	5	\$19,109
Electric refrigerators	428	495	211,860	5	\$48,934
Mixed refrigerators	60	1,105	60,900	5	\$14,066
Cold room**	1	55,000	55,000	5	\$12,704
TOTAL					\$101,744

Sources: NIP program; UNICEF

* With 5% discount rate.

**Present value of the investment made in 1972.

²⁹ Some recent donations of cold chain equipment have been documented by the NIP program; in 1996, UNICEF donated about \$20,000 worth of refrigerators, and between 1997 and 1998, Luxembourg donated about 250 refrigerators and freezers. These additions, however, are not reflected in the annual cold chain reports done by the provinces and submitted to the NIP program in Rabat. It is not clear whether these pieces of equipment are functioning as part of the program or are still in storage; therefore, these donations have not been included in this annual cost estimate for cold chain equipment.

Table C5. Annualized Cost Estimates for Minor Cold Chain and Sterilization Equipment for 1997-98

Type of Equipment	Number	Unit Price (DH)	Total Value (DH)	Useful Life, Years	Annualized Value per Unit (DH)	Total Annualized Cost (DH)*
Cold boxes (caisses isothermes)	523	3,408	1,782,384	5	787.16	411,685.78
Large vaccine carriers	1,956	321	627,876	5	74.14	145,023.53
Small vaccine carriers	3,911	185	723,535	5	42.73	167,118.35
Large sterilizers	3,078	1,070	3,293,460	5	247.14	760,702.26
Small sterilizers	1,455	950	1,382,250	5	219.43	319,264.91
TOTAL (DH)						1,803,698.84
TOTAL (US\$)						\$187,569

* With 5% discount rate.

An estimate of the annual costs of vehicles was made based on an estimation of the number and type of vehicles used by the MOH and an estimate of the percentage of time that these vehicles are used for immunization activities (see Table C6). The total estimated annualized cost of vehicles for the immunization program is \$57,498.

Long-term education and training is viewed as a long-term investment in the program. To date, only one current central-level NIP staff member has received such training. The estimated annual cost of this training, amortized over two years is \$8,510.

Table C6. Estimate of Vehicle Costs for Immunization Activities

Type of Vehicle	No.	Unit Price (DH)	Total Cost (DH)	% for Immunizations	Total Cost (DH)	Useful Life (years)	Annualized cost (DH)*
Freezer vans	2	400,000	800,000	33%	264,000	15	25,434
Vans	62	250,000	15,500,000	10%	1,550,000	10	200,732
Small vehicles	320	80,000	25,600,000	10%	2,560,000	10	331,532
TOTAL in DH							557,698
TOTAL IN US\$							\$ 57,499

* With 5% discount rate

Annex D. Assessment of the Functioning of the VII and the Revolving Fund in Morocco

The major question to be asked in assessing the performance of the Vaccine Independence Initiative and its revolving fund in Morocco is whether or not the VII mechanism as it currently functions is allowing the country to purchase sufficient amounts of vaccines on a regular basis, and without major delays or ruptures in supply. This question is addressed below, based on an analysis of the VII records kept by the local UNICEF office and the NIP program.

Time Required to Complete the Revolving Fund Cycle

The capacity of the VII to provide regular supplies of vaccines to meet the country's needs depends on a combination of two factors: the turnover rate of the fund—that is, the amount of time it takes to complete the cycle from placing vaccine orders to the government reimbursing UNICEF—and the capitalization level. The fund was apparently originally designed to turn over four times per year (Woodle, 1994), which would require a complete cycle to take no more than three months. Once it was realized that this would not happen, the plan was revised to two cycles per year (i.e., six months to complete a cycle). With the initial capitalization of \$600,000, this allowed Morocco to purchase \$1.2 million worth of vaccines in a year.

Figure 14 shows the average time it took for each major step in the cycle and for the completion of the entire cycle for each order placed from 1994 to mid-1998. (Details for each order are shown in Table D2.) These steps include: (1) the time it takes between the order being placed by UNICEF—the point at which funds are committed from the revolving fund—and the last delivery on that order for which an invoice is made (since there are often several deliveries made on one order and more than one invoice is submitted), (2) the time required by UNICEF to submit a bill to the government once the last delivery included on the bill is received, and (3) the time it takes the government to pay UNICEF once the bill is received.³⁰

As seen in the figure, it took an average of more than eight months to complete a cycle in 1994, and up to 13 months for some orders. At a turnover rate of eight months and a capitalization rate of \$600,000, this would limit the amount of purchases per year to \$900,000, which, would not have been adequate to meet the country's needs. The time required for all deliveries to arrive after the order was placed was averaging more than three months, and sometimes was taking up to six months. In addition, 1.8 months on average was required for UNICEF/Copenhagen to send the bill, and it was taking an average of 2.6 months, and as much as 4.8 months for the government to reimburse UNICEF upon receipt of the invoice. Since the VII was new to both the government and to UNICEF, it is not surprising that these delays occurred, since procedures had to be worked out on both sides to ensure the smooth functioning of this mechanism.

³⁰When orders were split and appeared on different bills, the partial orders were traced separately on the table.

Figure 14. VII in Morocco: Average Time Required to Complete the Revolving Fund Cycle, 1994-1998

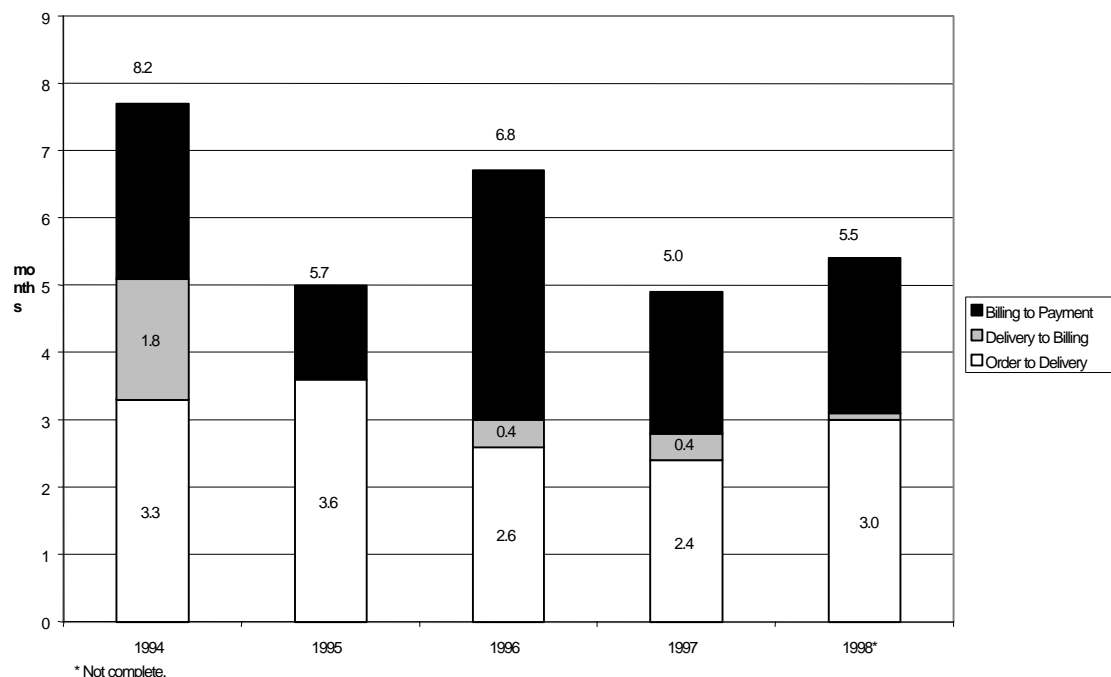


Figure 14 shows that the revolving fund cycle has indeed been shortened since 1994, and for the last two years (1997 to 1998) has averaged 5 to 5.5 months, meeting the target of two turnovers per year. Seventy-five percent of the reduction in the total cycle time since 1994 has been the result of UNICEF/Rabat assuming responsibility away from the Copenhagen office in 1995 to prepare and submit the invoices to the government. This reduced the average time required to send the invoice from almost two months in 1994 to only around seven days in the last two years. As shown in Table D2, the invoice sometimes now arrives before all deliveries on that invoice have been made.

In looking at other steps in the cycle, the average time it takes from the placement of the order by UNICEF to the arrival of the last delivery for that order, corresponding to one bill³¹ was between 2.4 and 3.6 months from 1994 to 1998. The order-to-delivery period for the last two years ranged from as little as 1.1 months to as much as five months. The time required for this step in the process has not been reduced significantly over the years, and since this step is in the hands of the vaccine suppliers, UNICEF/Rabat does not think that this will change.

Regarding the amount of time it takes the government to reimburse UNICEF once it receives a bill, the average time has ranged between only 1.4 months in 1995 to almost four months in 1996. For the last two years, it has averaged just a little over two months (2.2). Despite perceptions on both the government's and UNICEF's part to the contrary, the time required by the government to pay back UNICEF has not changed significantly since 1994, when it averaged 2.6 months.

³¹ To calculate the average time for the different steps of the cycle, this study used the invoice as the basic unit. Therefore, if several deliveries were made for a single order and more than one invoice was submitted (since UNICEF/Rabat tends to produce an invoice for several deliveries that arrive around the same time), the time required to complete the various steps of the cycle were calculated separately for each invoice. It is often the case that one small delivery of vaccines takes much longer than the rest of the order and is billed separately at a later date. Using the arrival date of the very last delivery of the entire order would give a misleading picture of the true time it takes from order to delivery.

As mentioned in the text, funds added by USAID in 1995 increased the capitalization of Morocco's revolving fund to \$1.1 million. At the rate of two complete turnovers per year (i.e., six months to complete a cycle), Morocco is now able to purchase \$2.2 million worth of vaccines annually through the VII. Indeed, once the \$500,000 was added to the fund at the end of 1995, the value of the annual contracts jumped from approximately \$1.3 million in 1995 to nearly \$2 million in fiscal year 1996/97 and to \$2.1 in 1998/99.

The amount of vaccines that Morocco can order in a year through the VII is also potentially limited by the capacity of the local UNICEF office to absorb local currency for its operational expenses. This was raised as a potential problem during the VII assessment conducted by UNICEF and USAID in mid-1994 (Woodle, 1994; Polsky, 1994). However, limited absorption capacity does not appear to have been a problem in Morocco up until the present time, in part because the local UNICEF office has an agreement to sell local currency to the local UNDP office, when necessary. This may be more of an issue in the future, if new, relatively expensive, vaccines, such as Hepatitis B, are purchased through the VII, as discussed in Section 6.1.3.

Since Morocco joined the VII in 1994, the government has been able to purchase more vaccines each year than originally anticipated in each contract. This is because the prices paid by the government are fixed at the beginning of the contract year, based on price estimates obtained by UNICEF at the time the contract is drawn up. Every year from 1994 to 1998, the actual prices of the vaccines have been lower than these estimates, due to the continuing reduction in vaccine prices on the world market. The government of Morocco, however, pays the higher prices established in the contract, and UNICEF/Copenhagen keeps track of the differences between what the government pays and what UNICEF pays for each order. This, plus exchange rate differences between the time Copenhagen buys the vaccine from suppliers and Morocco pays for them in local currency, has resulted each year in a "bonus" (*"reliquat"* in French), which the government has often used to buy needed vaccines when the revolving fund balance was low. At the end of the contract year 1996/97, this "bonus" was used to buy syringes, sterilizers, and other vaccine supplies, as well as 50,000 vials of BCG.

Past Problems with the Revolving Fund

A revolving fund requires that there be an adequate balance in the fund before any further orders can be placed. As discussed above, having sufficient funds in the revolving fund requires both adequate capitalization of the fund and a smooth and rapid replenishment of the fund, which, in turn, requires that deliveries be made promptly, bills be sent to the government quickly, and the government reimburses UNICEF in a timely manner. A slowdown in the revolving fund cycle for any reason—delayed deliveries, delayed billing, or delays in payment—can deplete the balance in the fund and prevent needed vaccine orders from being placed.

According to the data provided by UNICEF and the NIP, on a number of occasions there was a significant delay between the time the government made a request for vaccines and the order was placed by UNICEF/Copenhagen. On five occasions (once in 1994, three times in 1997, and once in 1998), UNICEF did not place the actual order until one to three-and-a-half months after the initial government request. Most of these delays were due to delays in the signing of the yearly VII contracts between UNICEF and the government, since UNICEF can not use revolving fund moneys to make purchases against a new contract until the contract is fully approved. Some delays were also due to there being an insufficient balance in the revolving fund to coverage the requested orders.

According to both the MOH and UNICEF, only once, in the fall of 1997, has the fund been depleted to the point where required vaccines could not be ordered in time, almost causing a crisis. The NIP originally made a request for polio and other vaccines in anticipation for the upcoming NIDs. However, at the time the order was placed, bills for the last two orders under the 1996/97 contract were outstanding, and amounted to an estimated \$885,086, leaving only around \$215,000 in the revolving fund. An analysis of the turnover rate for these last two orders shows that, while the third order on the 1996/97 contract—placed on April 30, 1997 and amounting to an estimated \$451,383—was delivered in a timely manner (around two months), it took almost four months for the government to reimburse the fund, which it did the end of October 1997.

This problem was compounded by the fact that another order—the fourth on the 1996/97 contract, amounting to an estimated \$433,703 had been placed only about a week after the third one (May 7). While most of the deliveries on this order arrived within three months (by the end of July), a small delivery of 50,000 vials of DPT did not arrive till the end of August, resulting in a period of almost four months between the time the order was placed and the arrival of the last delivery. UNICEF submitted two invoices for this order, one at the end of August and one in early September. By this time, the problem was apparent, and the MOH was able to pay the bill a month after it was received (on September 30).

To avert a shortage of OPV during the upcoming NIDs, the government placed a smaller order of OPV on September 5, using the remaining balance of \$215,000 in the fund. Five days later, UNICEF placed a larger order of OPV plus some measles vaccine on an advance basis. As mentioned above, the government very promptly paid off the fourth order on September 30, and then paid off the third order the end of October, replenishing the fund.

To help prevent further cash flow problems, UNICEF/Rabat began in 1998 to send the government invoices for each separate delivery or group of deliveries that arrived around the same time. Thus, instead of only two to four large bills being prepared a year, as in the past, five invoices in 1998 had already submitted by the end of July and all of these were paid by the end of September. If this had been the case with the fourth order of 1996/97, where one small delivery delayed billing by a month, most of the order could have been paid off sooner, and the cash flow problem could have been averted.

Table D1. Amount of Vaccines Ordered through the VII in Morocco: 1994–1998

Calendar Year	Antigen	No. Doses Received	Total Amount (US\$)	VII Contract Amount (US\$)
1994	BCG	1,800,000		
	DPT	1,750,000		
	Measles	1,700,000		
	Polio (oral)	3,400,000		
	TT	1,000,000		
	Total	9,650,000	\$1,037,998	\$1,023,276*
1995	BCG	1,000,000		
	DPT	3,000,000		
	Measles	2,000,000		
	Polio (oral)	3,000,000		
	TT	5,700,000		
	Total	14,700,000	\$1,289,399	\$1,293,988**
1996	BCG	1,800,000		
	DPT	1,900,000		
	Measles	1,000,000		
	Polio (oral)	7,900,000		
	TT	2,000,000		
	Total	14,600,000	\$1,445,390	\$345,500 (1st semester of 1996 only)
1997	BCG	2,700,000		
	DPT	2,300,000		
	Measles	1,730,000		
	Polio (oral)	8,900,000		
	TT	3,000,000		
	Total	18,630,000	\$1,857,124	\$1,976,150 (FY 1996/97)
1998 (only up to April orders -need for rest of year)	BCG	2,600,000		
	DPT	3,500,000		
	Measles	1,470,000		
	Polio (oral)	10,100,000		
	TT	2,500,000		
	Total	20,170,000	\$1,832,880 (not complete)	\$2,019,500 (FY 1997/98)

Source: UNICEF/Rabat

* Contract was expressed in dirham; this is an estimate based on exchange rate of 8.927 DH per US\$.

**Based on exchange rate of 8.5 DH per US\$.

Table D2. Time Required to Complete the Cycle and Steps in the Cycle of the Morocco Revolving Fund: 1994–1998 (in Months)

Calendar Year	Date Order Registered by UNICEF/ Copenhagen	Time from Order to Last Delivery (for Corresponding Bill)	Time from Last Delivery to Receipt of Invoice	Time from Invoice Date to Payment	Total Cycle Time
1994	3/7/94	2.2	2.5	1.2	5.9
	3/7/94	6.2	1.4	1.6	9.2
	5/31/94	4.4	0.4	1.6	6.3
	5/31/94	4.4	3.5	4.8	12.7
	8/31/94	2.8	2.1	4.8	9.6
	8/31/94	0.9	0.8	1.6	3.3
	12/01/94	2.5	??	??	10.7
Average:		4.5	1.8	2.6	8.2
1995	1/15/95	2.9	??	??	9.2
	5/4/95	5.1	(0.4)	1.3	6.0
	7/31/95	2.2	1.0	1.3	4.4
	10/17/95	4.4	(2.7)	1.6	3.3
Average:		3.6	(0.7)	1.4	5.7
1996	2/27/96	3.3	0.1	2.0	5.4
	9/3/96	1.4	0.2	4.8	6.4
	9/3/96	2.2	1.1	4.6	7.9
	10/30/96	3.7	0.2	3.5	7.4
Average:		2.6	0.4	3.7	6.8
1997	4/30/97	2.1	0.5	3.4	6.0
	5/7/97	2.8	0.8	1.2	4.9
	5/7/97	3.8	0.1	1.0	4.9
	9/5/97	1.1	0.2	4.5	5.8
	9/10/97	2.6	1.4	1.6	5.7
	12/3/97	1.8	0.0	1.6	3.5
	12/3/97	2.8	0.0	1.6	4.4
Average:		2.4	0.4	2.1	5.0
1998 (not complete)	2/2/98	2.9	0.2	1.2	4.3
	2/2/98	5.0	0.5	2.5	8.0
	3/23/98	3.3	(0.5)	3.6	6.4
	3/23/98	4.0	(0.1)	2.5	6.4
	4/28/98	2.6	0.1	2.5	5.2
	9/15/98	1.4	0.1	1.6	3.1
	11/14/98	2.3	0.2		
	11/14/98	2.7	no bill yet		
	11/14/98	3.1	not delivered yet		
Average:		3.0	0.1	2.3	5.5
Average 1997–1998		2.8	.25 (7.5 days)	2.2	5.3

Annex E. Supplementary Tables for Section 5 (Cost and Financing Projections)

Table E1. Estimated Cost of Replacing Cold Chain and Other Vaccination-Related Equipment over Five Years

Equipment	No.	Unit Price (DH)	Total (DH)
Large refrigerators (<i>armoires frigorifiques</i>)	73	15,000	1,095,000
Freezers	212	5,000	1,060,000
Electric refrigerators	1,284	5,000	6,420,000
Mixed-fuel refrigerators	1,080	11,343	12,250,440
Cold Boxes	523	3,408	1,782,384
Large vaccine carriers	1,956	321	627,876
Small vaccine carriers	3,911	185	723,535
Large sterilizers	3,078	1,070	3,293,460
Small sterilizers	1,455	950	1,382,250
TOTAL IN DH			DH 28,634,945
TOTAL IN US\$*			\$ 3,014,205
Maintenance (2 percent/year)			\$ 60,284
TOTAL IN US\$			\$3,074,489
TOTAL PER YEAR (over 5 years)			\$614,898

* Using exchange rate of DH 9.5 = \$US1.

Table E2. Cost of Equipment New Health Facilities with Cold Chain Equipment over Next Five Years*

Type of Facility	Avg. No. New Facilities per Year	No. Freezers per Facility	No. Refrigerators per Facility	No. Cold Boxes per Facility	No. Large Vaccine Carriers per Facility	No. Small Vaccine Carriers per Facility	Total Cost (US\$)
Urban Health Centers	30	1	1	2	2	2	\$61,536
Rural Health Centers with delivery services	6	1	1	2	2	2	12,307
Rural Health Centers (no delivery services)	8	1	1	2	2	2	16,410
Rural Dispensaries	31	0	1	1	1	1	35,669
TOTAL	75	3	4	7	7	7	\$125,921

* Assumes that 75 new facilities will be built each year between 1999/2000 and 2003/2004.

Table E3. Estimated Costs of Cold Room Renovation and Construction (US\$)

Item	Cost (US\$)
Renovation of central store in Casablanca (1999/2000)	70,000
New addition to central store in Rabat (1999/2000)	22,000
Construction of one regional cold room per year (from 2000/01 to 2003/04):	
▲ Base price	76,000
▲ Maintenance	1,250
▲ Total/unit	\$77,250

Table E4. Projected Government Funding Gap for “Basic” Immunization Program and Program with Planned Improvements,

	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	Total
Projected funding with World Bank funds assumed after 2000/2001	\$3,022,758	\$3,325,034	\$3,657,537	\$4,023,291	\$4,425,620	\$18,454,240
Projected funding without World Bank funds assumed after 2000/2001	3,022,758	3,325,034	954,225	1,238,879	1,557,676	9,798,572
Cost of “basic” program	2,978,251	3,067,598	3,159,626	3,254,415	3,352,047	15,811,937
Funding gap/surplus with World Bank funds assumed	44,507	257,436	497,911	768,876	1,073,573	2,642,303
Funding gap/surplus without World Bank funds assumed	44,507	257,436	(2,205,401)	(2,015,536)	(1,794,371)	(6,013,365)
Required program expenditures with planned improvements	6,212,436	6,314,910	6,435,952	6,549,284	6,654,447	32,167,029
Funding gap with World Bank funds assumed	(3,189,678)	(2,989,876)	(2,778,415)	(2,525,993)	(2,228,827)	(13,712,789)
Funding gap without World Bank funds assumed	(3,189,678)	(2,989,876)	(5,481,727)	(5,310,405)	(5,096,771)	(22,368,457)

* Projections assume an annual increase in the government budget of 10 percent and an annual inflation rate of 3 percent.

Annex F. Supplementary Tables for Section 6

Table F1. Estimated Cost Savings with Decrease in Vaccine Wastage of 10% for all Antigens

Vaccine	No. Vials (including NIDs, etc.)	Current Wastage Rate	10% of Wastage	Wastage Less 10%	New Wastage Coefficient	Total No. Vials Required	Price (US\$)	Total Cost (US\$)
BCG	31,890	0.74	0.07	0.67	2.99	95,479	\$1.29	123,168
DPT	184,356	0.28	0.03	0.25	1.34	246,465	\$0.86	211,960
OPV	514,251	0.09	0.01	0.08	1.09	559,577	\$0.98	548,385
Measles	67,014	0.60	0.06	0.54	2.17	145,683	\$1.38	201,042
TT	266,100	0.22	0.02	0.20	1.25	331,796	\$0.55	182,488
TOTAL								\$1,267,043
Cost with Current Wastage								\$1,351,451
Cost Saving								\$84,408
% Cost Saving								6.25%

Table F2. Estimated Cost Savings with Decrease in Vaccine Wastage of 20% for All Antigens

Vaccine	No. Vials (including NIDs, etc.)	Current Wastage Rate	20% of Wastage	Wastage Less 20%	New Wastage Coefficient	Total No. Vials Required	Price (US\$)	Total Cost (US\$)
BCG	31,890	0.74	0.15	0.59	2.45	78,162	\$1.29	100,829
DPT	184,356	0.28	0.06	0.22	1.29	237,572	\$0.86	204,312
OPV	514,251	0.09	0.02	0.07	1.08	554,150	\$0.98	543,067
Measles	67,014	0.60	0.12	0.48	1.92	128,873	\$1.38	177,845
TT	266,100	0.22	0.04	0.18	1.21	322,937	\$0.55	177,615
TOTAL								\$1,203,668
Cost with Current Wastage								\$1,351,451
Cost Saving								\$147,783
% Cost Saving								10.94%

Table F3. Estimated Cost Savings with 25% Decrease in Wastage of BCG and Measles Vaccine Only

Vaccine	No. Vials (including NIDs, etc.)	Current Wastage Rate	25% of Wastage for BCG & Measles	Wastage less 25%	New Wastage Coefficient	Total No. Vials Required	Price (US\$)	Total Cost (US\$)
BCG	31,890	0.74	0.19	0.56	2.25	71,663	\$1.29	92,445
DPT	184,356	0.28	0.00	0.28	1.39	256,050	\$0.86	220,203
OPV	514,251	0.09	0.00	0.09	1.10	565,111	\$0.98	553,809
Measles	67,014	0.60	0.15	0.45	1.82	121,844	\$1.38	168,144
TT	266,100	0.22	0.00	0.22	1.28	341,154	\$0.55	187,635
TOTAL								\$1,222,236
Cost with Current Wastage								\$1,351,451
Cost Saving								\$129,215
% Cost Saving								9.56%

Table F4. Mix of Financing under Scenario 1* (US\$)

Source	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	Total	% of Total in 2003/04
World Bank (just TA)							
Donors:							
IEC	101,096	104,129	107,253	110,471	113,785	536,734	
Vitamin A	15,633	16,102	0	0	0	31,735	
Short-term training	3,072	3,165	3,259	3,357	3,458	16,311	
Sub-total donors	119,801	123,396	110,512	113,828	117,243	584,780	2.1%
Regions	0	172,795	237,158	555,510	572,175	1,537,638	10.3%
Central government budget (remainder)	4,801,740	5,074,497	5,094,236	4,832,852	4,861,313	24,664,638	87.6%
TOTAL	\$4,921,541	\$5,370,688	\$5,441,906	\$5,502,190	\$5,550,731	\$26,787,056	100.0%

* Assumes World Bank loan funds ends in 1999/2000 and the government picks up these costs right away. No role for insurance in financing immunizations.

Table F5. Mix of Financing under Scenario 2* (US\$)

Source	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	Total	% of Total in 2003/04
World Bank							
EPI vaccines	2,352,741	2,423,323					
HBV	1,685,025	841,143					
Supplies	167,342	491,914					
Transportation	28,048	28,890					
Sub-Total World Bank	4,233,156	3,785,269	0	0	0	8,018,425	0.0%
Donors:							
IEC	101,096	104,129	107,253	110,471	113,785	536,734	
Vitamin A	15,633	16,102	0	0	0	31,735	
Short-term training	3,072	3,165	3,259	3,357	3,458	16,311	
Sub-Total Donors	119,801	123,396	110,512	113,828	117,243	584,780	2.1%
Regions	0	172,795	237,158	555,510	572,175	1,537,638	10.3%
Insurance (up to 10%)	0	0	269,755	535,291	528,018	1,333,064	9.5%
Central government budget (remainder)	568,584	1,289,228	4,824,481	4,297,561	4,333,295	15,313,149	78.1%
TOTAL	\$4,921,541	\$5,370,688	\$5,441,906	\$5,502,190	\$5,550,731	\$26,787,056	100.0%

* Assumes a more gradual withdrawal of World Bank funding for recurrent costs and insurance covering 10% of all children under 1 by 2002/2003.

Table F6. Mix of Financing under Scenario 3* (US\$)

Source	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	Total	% of Total in 2003/04
World Bank							
EPI vaccines	2,352,741	2,423,323					
HBV	1,685,025	841,143					
Supplies	167,342	491,914					
Transportation	28,048	28,890					
Sub-Total World Bank	4,233,156	3,785,269	0	0	0	8,018,425	0.0%
Donors:							
IEC	101,096	104,129	107,253	110,471	113,785	536,734	
Vitamin A	15,633	16,102	0	0	0	31,735	
Short-Term training	3,072	3,165	3,259	3,357	3,458	16,311	
Sub-Total Donors	119,801	123,396	110,512	113,828	117,243	584,780	2.1%
Regions	0	172,795	237,158	555,510	572,175	1,537,638	10.3%
Insurance (up to 20%)	0	0	539,510	802,937	1,056,036	2,398,482	19.0%
Central government budget (remainder)	568,584	1,289,228	3,694,426	2,749,557	2,121,329	10,423,124	68.6%
TOTAL	\$4,921,541	\$5,370,688	\$5,441,906	\$5,502,190	\$5,550,731	\$26,787,056	100.0%

* Assumes a more gradual withdrawal of World Bank funding for recurrent costs and insurance covering 20% of all children under 1 by 2002/2003.

Annex G. Immunization Coverage by Region

Table G1. Immunization Coverage of Children Less Than One Year of Age, by Region and by Antigen, Morocco 1997: Global Results

Region	Population	BCG	DPT/Polio3	Measles
Tanger Tetouan	51638	93%	84%	80%
Taza-Al Hoceima-Taounate	41767	95%	84%	82%
Fes-Boulmane	29802	100%	90%	85%
Meknes-Tafilalet	42784	95%	88%	86%
Tadla Azizal	31143	104%	90%	92%
Rabat Salé Zemmour-Zair	42447	91%	94%	93%
Doukkala Abda	41643	106%	98%	94%
Grand Casablanca	59606	78%	79%	78%
Orientale	36949	106%	95%	92%
Marrakech-Tensift- El Haouz	66856	101%	92%	88%
Chaouia-Ourdhiga	32721	107%	103%	99%
El Gharb-Gharda-Bni Hssen	38205	89%	80%	79%
Souss-Massa-Draa	67867	90%	84%	81%
Guelmin-Smara	9649	91%	86%	88%
Laayoune-Boujdour-Saki	4407	101%	104%	96%
Oued Eddahab-Lagouira	893	139%	136%	129%
Total	598377	95%	89%	86%

Annex H. Bibliography

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